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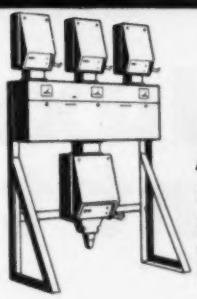

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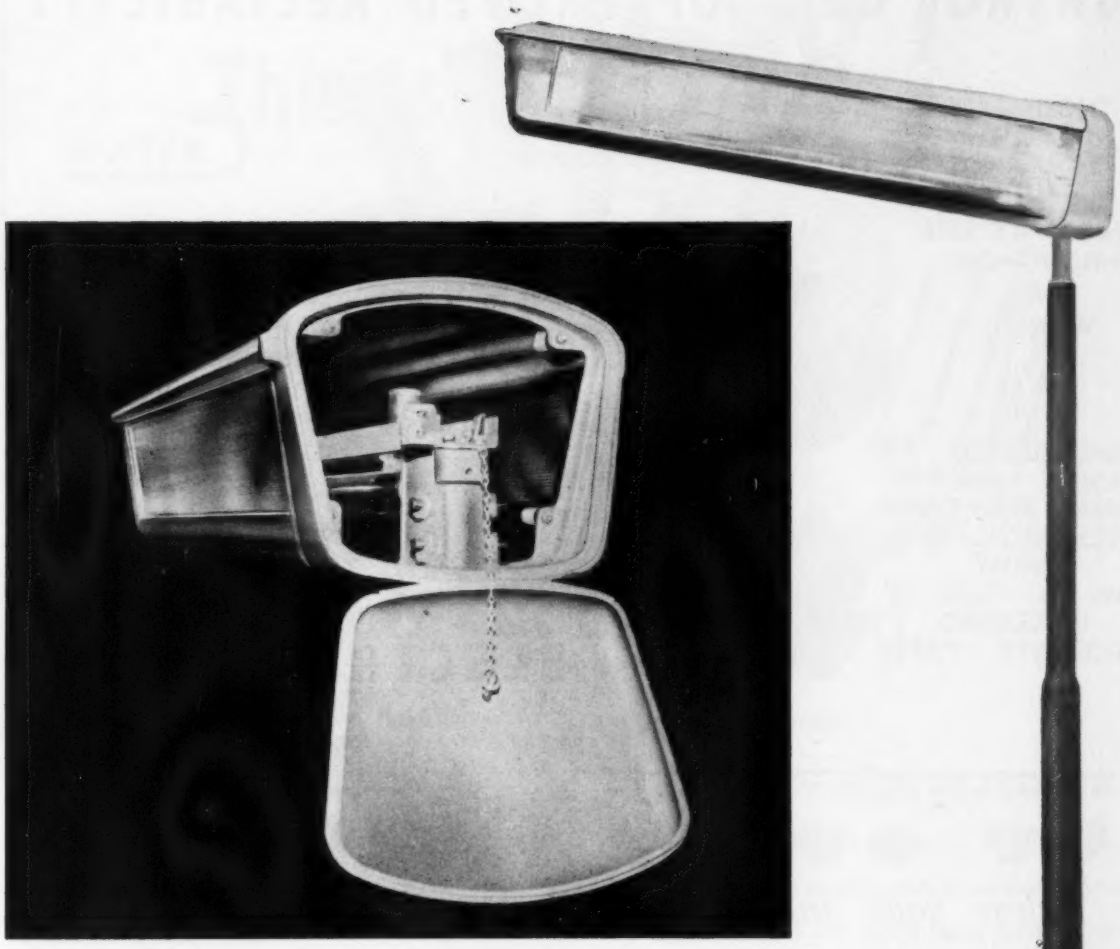

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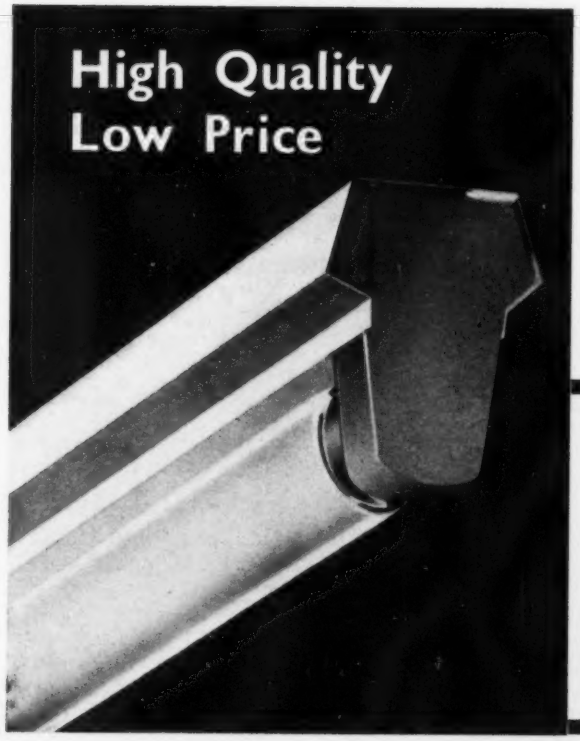

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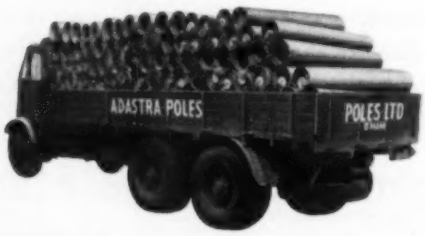

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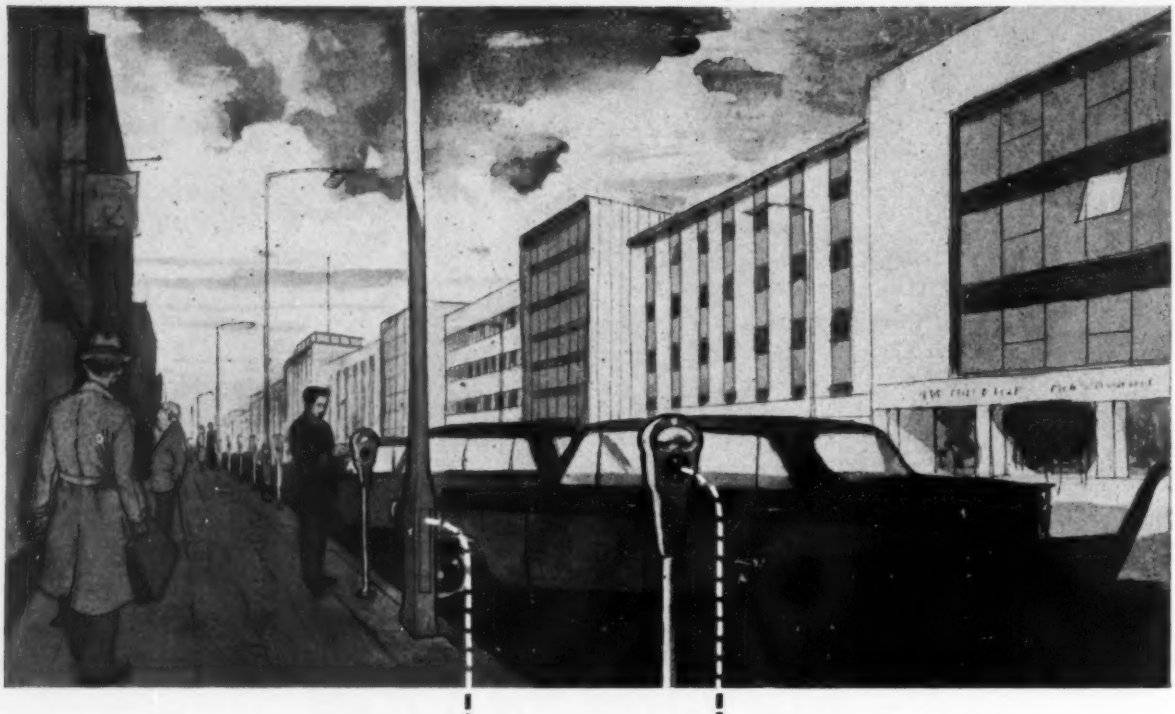

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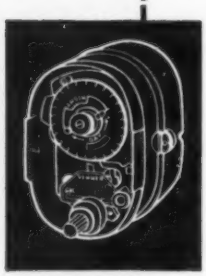

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Light and LIGHTING

Vol. 52 No. 8/9 August/September, 1959

Published by The Illuminating Engineering Publishing Co. Ltd. on the 1st of each month at 32, Victoria Street, London, S.W.1. Telephone: ABBey 7553. Subscription rate 30s. per annum.

contents

100 Lumens Per Watt

The latest achievement of our electric lamp industry—the production of 100 lumens per watt sodium lamps—is an outstanding one, and one that enhances the already high British prestige in matters of lighting. It is very doubtful whether the general public—who are the beneficiaries of the industry's 'will' to ever more efficient light sources—realise how cheaply good lighting can be had nowadays by means of modern electric lamps. In the domestic field sodium lamps are unsuitable but there are, of course, other very efficient lamps for home lighting and the amenity of better lighting in the home can surely be afforded if refrigerators, washing machines, radio and television can be. Here is one great 'consumer field' in which many buyers do not seem to know what a good bargain good lighting is—what a lot of light they can now have at so little expense. The sodium centiwatt per lumen lamps will give us cheaper and/or better lighting in our streets, and in other places where good colour rendering is not essential, but lamp research aimed at improving the luminous efficiency of sources of 'white' light will go on and we do not doubt it will be successful.

Notes and News

UNDER its Articles of Association, The Illuminating Engineering Society is empowered to elect as an Honorary Fellow any distinguished person whom the Society desires to honour. Not more than one Honorary Fellow may be elected in any one year and the total of such Honorary Fellows at any time is limited to six in number.

The Council of the Society has announced that His Royal Highness The Duke of Edinburgh, KG, KT, has accepted its invitation to become the first Honorary Fellow of the Society and has expressed his interest in the extremely useful work being carried out by the Society.

It must indeed be gratifying to the Council and members of the IES that this election has taken place during this momentous Golden Jubilee year of the Society. The election of His Royal Highness to Honorary Membership and the terms in which the Council's invitation has been accepted will be a great stimulus and encouragement to the Society.

IES Jubilee Activities

The almost complete absence of printing for several weeks and the consequent delays in printing from which we are likely to suffer for a few more weeks, have meant that many of the IES Golden Jubilee events throughout the country have not received the advance publicity which was intended. A number of events have in fact taken place during the last few weeks and we regret that we were unable to draw attention to them.

Nevertheless, in spite of the many difficulties with which they have had to contend several of the IES Centres have carried through their programmes with great success. We hope to have more to say about these events in due course but in the meantime we would congratulate those concerned with such events as the exhibition in Leeds, the floodlighting in Bristol and the exhibition at Glasgow. At Leeds a very successful exhibition intended to interest the general public in lighting matters was arranged by the Leeds Centre for five days, being opened by the Lord Mayor of Leeds and attracting a good deal of attention in the city. At Bristol arrangements by the Bath and Bristol Centre to floodlight Brandon Hill in October had suddenly to be brought forward to September 1st to coincide with revised plans by the city to floodlight the Clifton Suspension Bridge as part of the Brunel centenary celebrations. The exhibition at Glasgow, which runs until September 21st, is at the Glasgow Art Galleries and has been arranged to coincide with the Scottish Industries Exhibition at the Kelvin Hall. In all these and other instances the local authorities have closely co-operated with the Society; indeed at the time of writing we gather that the IES President, Mr. C. C. Smith, and his vice-presidents are having a job to keep all the appointments that have been made on their behalf with Lords Mayor, Lords Provost and other civic dignitaries who are gracing these many activities of the Society.

Other similar events are yet to come in the provinces. At Nottingham, the Centre opens its Jubilee activities with a Civic Lunch on September 23rd followed during the next two days by lectures at the University and another to 2,000 school children. An exhibition is being arranged in Leicester, and at Manchester during October there will be a Civic Reception at the City Hall, a series of three lectures on lighting and human relations and another exhibition. During October the Liverpool Centre is arranging the floodlighting of the tower of the cathedral. There can be no doubt that the provincial Centres of the IES are putting a lot of hard work into the Jubilee and are making a great contribution to furthering the interests of the Society and of better lighting.

And now to London. First comes the opening sessional meeting on Tuesday, October 13th, when the new President, Mr. H. G. Campbell, will present his presidential address. (An unfortunate break in tradition is that this meeting will not be at the Royal Institution but at the Federation of British Industries in Tothill Street.) Following this there will be a series of four special Golden Jubilee lectures by very eminent lecturers as follows:—

Thursday, October 15th.
"The Nature of Light," by Sir Lawrence Bragg, FRS.
At The Royal Institution, Albemarle Street, W.1.
Chairman: Mr. O. W. Humphreys, CBE.

Monday, October 19th.
"The Generation of Light,'" by Mr. L. J. Davies.
At Caxton Hall, Caxton Street, Westminster, S.W.1.
Chairman: Sir Harold Hartley, FRS.

Thursday, October 22nd.
"Light and Road Safety," by Dr. W. H. Glanville, FRS.
At The Institution of Civil Engineers, Great George Street, S.W.1.
Chairman: Mr. R. Gresham Cooke, MP.

Tuesday, October 27th.

"Light and Productivity," by Mr. A. N. Irens.

At The Federation of British Industries, Tothill Street, S.W.1.

Chairman: Sir Alexander Fleck, FRS.

These lectures are intended primarily for those who are not members of the Society, e.g. the first lecture for teachers of science at universities, technical colleges, etc., the second for electrical engineers and scientists, the third for municipal authorities, and the last for industrialists. Admission to each lecture will be by ticket only and applications for tickets (which should clearly state the lecture for which tickets are required) should be made to the IES Secretary. (We gather that IES members will not be refused tickets.) The list of lecturers and chairmen is certainly very impressive. All lectures begin at 6 p.m.

To conclude the Jubilee celebrations in London itself there is to be a Reception at the County Hall on Friday, October 30th. This form of the final social function was chosen to enable as many members as possible to take part with their wives and guests. It will be remembered that the dinner in February (which we think we can rightly describe as a brilliant occasion) was restricted to men only; none the less there were 450 people present and a good turnout can therefore be expected for Mr. Campbell's Reception in October. That the London County Council should give the Society the privilege of holding its Reception at County Hall is itself an honour to the IES. The time of the Reception is 7 p.m. to 11 p.m.; tickets are two guineas each; the dress is black or white tie with orders and decorations.

One other Jubilee item which will run from September 14th to November 7th is a lighting display at the Design Centre in Lower Regent Street. This has been arranged by the Council of Industrial Design in conjunction with the IES. It will include two fully furnished and equipped rooms showing different types of domestic lighting, and displays of fittings for use in homes, offices and shops. We gather that a number of retail stores around the country will be arranging similar displays on domestic lighting at the same time.

And that, we hope, gets us up to date with IES Jubilee activities. As we mentioned earlier, we intend to report many of them in greater detail in another issue.

Light in the Glasshouse

The importance of the role which artificial lighting is expected to play in gardening and in horticulture in the future has been emphasised in an "automatic glasshouse" which has been exhibited at some of the leading agricultural shows this summer.

The "automatic glasshouse" at the Chelsea Flower Show. (Reproduced by permission of "The Gardeners' Chronicle and Gardening Illustrated".)

Primarily designed and built as part of the outstanding British contribution at the Floralies Internationale in Paris, it was also featured prominently in *The Times* Garden of Tomorrow at Chelsea Flower Show.

Artificial lighting for supplementing low levels of winter daylight is provided by rows of experimental high-loaded 8-ft. reflector fluorescent tubes mounted at the ridge and in the apex. These are controlled by a photo-electric cell which switches them on automatically when the daylight level falls to a pre-set value. Full use is also made of the space under one of the propagating benches by the inclusion of a totally enclosed "growing cabinet." Separately heated and ventilated, the cabinet is fitted with four 80-watt reflector fluorescent tubes to provide light for photosynthesis and two 40-watt tungsten lamps for separate photoperiod control. Here seedlings may be raised and plants grown in a "natural environment provided artificially," and quite indepedent of climatic variations.

Futuristic? Not really. Both of these applications are in widespread use in horticulture already in some form or other and it is only the economic aspect which limits their adoption on a large scale by thousands of amateur gardeners. An automatic glasshouse? Not completely. You still have to pick your ripe fruit and flowers—and who would wish to be denied that pleasure?

This Issue

In order to minimise the disruption caused by the recent difficulties of the printing industry and by the consequent delays, we have found it necessary to combine the August and September issues of the journal. We hope readers will approve of this action. We would also apologise for lateness in delivery and hope we will be back to normal with the October issue.

The floodlight spire of the Hotel de Ville, which is but one of the beauties of the Grand Place at Brussels.

CIE Brussels, 1959

Report by G. F. Cole, on the proceedings at the XIVth Session of the International Commission on Illumination

Brussels in retrospect—by Dr. J. W. T. Walsh who was President of the CIE during the Brussels meeting

As one of those least qualified to express an opinion regarding the success of the CIE meetings in Brussels, I can only say that the general impression seemed to be very favourable. Some of the smaller delegations, in particular, expressed the view that the technical meetings had been most valuable to them. This brings out a point not always appreciated by delegates from the countries where lighting techniques are now highly developed, viz. that the value of a CIE Session is naturally, and rightly, greatest to those countries where lighting is least advanced.

The new arrangement of technical committees, by which the CIE brings together experts from different countries to thrash out round the table problems of common interest, seems to be working well. It has naturally experienced some growing pains in this initial period, and a few comparatively minor modifications are suggested as the result of experience, but progress should be steady and, in fact, gather momentum during the next four years.

The excellence of the arrangements for both the technical and the social sides of the Session elicited high praise from everyone. For this all credit must go to the Secretariat, with MM. Le Grand and Chappat seeming to be everywhere at once, watchful that nothing should go wrong with the technical programme, and to the Belgian Organising Committee, particularly M. Boereboom and his assistants, who always seemed ready to deal with an emergency immediately it arose. A word, too, should be said in praise of the Brussels Hostesses whose " service with a smile " seemed to be available to everyone at all times.

The Commission was undoubtedly most fortunate in the venue of its XIVth Session. I am quite certain, too, that it is very fortunate in its choice of a new President, and that under Mr. Folcker's guidance it will continue to do most valuable work, culminating in a XVth Session which will crown with success its fifty years of existence as a body devoted to the furtherance of better lighting throughout the world.

THE fourteenth session of the International Commission on Illumination (CIE) took place in Brussels from June 15th to 24th and was attended by over 500 delegates from 26 countries. Great Britain was represented by 85 delegates. Countries which sent delegates included: South Africa, Germany, Australia, Austria, Belgium, Brazil, Canada, Denmark, Spain, Finland, France, Great Britain, Hungary, Iceland, Israel, Italy, Japan, Norway, Holland, Poland, Sweden, Switzerland, Czechoslovakia, USA, USSR, and Yugoslavia.

The meeting took place under the presidency of Dr. J. W. T. Walsh and terminated his four year period of office. The arrangements for the meeting were the responsibility of the Belgian National Committee on Illumination under General E. E. Wiener, the detailed organisation being in the hands of an organising committee under M. Andre Boereboom.

Technical meetings took place at the Palais des Congrès in the centre of Brussels where full facilities for the running of large conferences, including simultaneous translation, were available.

At the last meeting of the CIE in Zurich in 1955 a new system of study committees was adopted whereby subjects were allocated, according to the nature and/or urgency of the work to be done, either to Working (W) Committees or to Secretariat (S) Committees. Where the task was mainly the collection and interchange of information the subject was given to an S-committee which had to prepare a report on progress for submission at the next meeting in four years time. Where the subject called for more urgent attention a W-committee was appointed consisting of experts in that particular subject who were empowered to proceed with the work and to draw up a report or recommendations for publication (after approval by the Executive Committee) with-

out necessarily submitting a draft to a full CIE meeting. It was on this basis that the work at Brussels was organised though the system of W-committees had not worked out quite as had been expected. Most of the W-committees held special meetings before June 15th and for many it was the first time that all the expert members had been able to attend a committee meeting. At these pre-session meetings quite a lot of spade-work was done and many projects which had been under consideration for the last two or three years progressed considerably.

At this point it might be mentioned that at the closing plenary meeting at Brussels some changes in the organisation and methods to be adopted by the W-committees were agreed. They are now to be known as Expert (E)-Committees with an agreed code of procedure which lays down how the work is to be conducted and who is responsible for seeing that it proceeds. This new code eliminates most of the inadequacies of the 1955 procedure and responsibility for each E-committee is now given to an appointed national committee. Both chairman and secretary of an E-committee are appointed by the national committee concerned (see table at the end of this article) and whilst the chairman is responsible for the immediate tasks of the committee, it is the national committee's responsibility to see that a general progress report on the subject is prepared for the next CIE meeting. The number of E- and S-committees has been reduced and there are now 18 E-committees and five S-committees, a considerable change in procedure from earlier days of the CIE when all the committees were of the secretariat type.

At the opening plenary session on the morning of Monday, June 15th, delegates were welcomed to Brussels by General Wiener, and Dr. Walsh gave a brief review of the work of committees during the four years since the last meeting and indicated the programme to be followed during the next ten days. Then followed a lecture on light and human activities by Prof. Morren of Louvain University which was illustrated by an excellent collection of colour slides.

In the afternoon the work of the various technical committees began and continued at some pressure for the remainder of the week. No papers were presented during the first week but were all given during the first two days of the following week. This enabled the time allocated to technical committees to be devoted entirely to their particular subject instead of having to call a halt to discussion half way through the morning or afternoon (as had been the case at previous CIE meetings) to enable papers to be presented. The new procedure was generally agreed to be a better one.

In the account which follows subjects are dealt with in convenient groups and are not given in the order in which they were presented at the meeting. References to papers which were given will be found under the appropriate group heading.

Light Sources

Light sources are covered by two committees, one dealing with sources of visible radiation (secretariat, Sweden) and the other with ultra-violet and infra-red sources (Germany). The report on sources of visible radiation included little that is not already well known to most lighting people but was nevertheless a useful review of progress and developments in the wide range of lamps. Electroluminescence was dismissed in one brief paragraph which referred people wanting more information to the paper by Bowtell and Bates in the IES Transactions (p. 223, 1955). A paper on new sodium lamps was given by W. Verweij and M. H. A. v. d. Weijer (Holland) who described the new lamps which have a single evacuated outer bulb around the discharge tube and referred to an experimental 250-watt lamp.

In the discussion of the report itself Dr. Hibben (USA) referred to the axial mounted tungsten filament lamp pointing out that the cylindrical bulb not only had smaller dimensions but was more convenient for packaging. He also said that the use of sodium lamps was dying out in the USA and were being replaced by colour corrected fluorescent mercury lamps. Dr. Hibben also referred to the increasing use of fluorescent tubes in hairpin form which had the advantage that all connections were at one end. On the colours of fluorescent lamps Mr. Ruff (Great Britain) confirmed that there was now international agreement on all colours except for a small difference in the case of warm white and this he expected to be resolved at the IEC meeting to be held in Madrid immediately after the Brussels meeting. A paper on "Some problems on the physics of fluorescent lamps" was given by F. A. Butaeva, B. A. Fabricant and A. L. Nedospasov (USSR).

The committee on UV and IR radiation was concerned mainly with the development of methods and apparatus used for measurement and national committees were asked to collect information. A paper on the measurement of UV radiation in energy units and in effective units was given by D. N. Lazarev, M. V. Sokolov and D. A. Shklover (USSR).

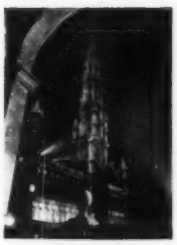
At the opening plenary meeting, Yves Le Grand, Gen. Wiener, Dr. Walsh, Ward Harrison, W. Von Hemert and M. Jacob listening to Prof. Morren.

Heads of national delegations and members of the executive.

Colour

Under this heading are grouped the three W-committees dealing respectively with colorimetry, colour rendering, and the colour of light signals —probably three of the hardest worked committees of the CIE.

Colorimetry



The terms of reference of this committee (chairman Dr. D. B. Judd (USA)) include the formulation of a proposal for the revision of the 1931 CIE standard observer and co-ordinate system for colorimetry by a critical consideration of recent colour-mixture data for both the 2° and the 10° field, and to evaluate the merit of the proposal by subjecting it to a wide variety of practical field tests. This is probably the most important item on the committee's agenda—though other matters are dealt with in the report. At a meeting of the committee in 1957 it was agreed to formulate a set of colour-mixture functions for 10° fields of high luminance based on data supplied by Stiles and Burch at the NPL and by Speranskaya at Leningrad. At Brussels it was agreed that it was still premature to adopt the new large field data which, in view of the amount of work which has been put into this problem during the last few years, particularly by Dr. Stiles and his colleagues, was a rather disappointing decision. However, as some of the field tests recently undertaken have failed to line up sufficiently closely with the laboratory tests it is probably a wise decision to defer agreement until the reasons for the discrepancies have been established beyond all doubt.

Gunnar Tonnquist (Sweden) gave a paper in which he explained a method of obtaining metameric spectral functions giving a reasonable resemblance to real functions.

Colour rendering

This committee under the chairmanship of Dr. W. Munch (Germany) has held several meetings since 1955 and is preparing three publications dealing respectively with (a) terminology, (b) assessment of colour rendering using a spectral band method, and (c) a method of measuring and specifying colour rendering based on colour shift of a group of test objects. The report presented at Brussels reviewed work on these subjects up to date and included an appendix giving the so-far agreed terms to be used in colour rendering. This committee was one of those which took the opportunity to meet a few days before the beginning of the actual meeting in Brussels, its pre-meeting discussions being concerned mainly with the two methods of defining colour rendering which have been proposed, i.e., spectral bands and colour shift. The CIE 1948 spectral band method was criticised on several grounds and strong pressure was brought to bear in an attempt to reject this system in favour of the colour shift system which was favoured by Germany and the USA. However, it was eventually agreed that the colour shift system did not lend itself to rapid routine measurements and it suffered from the limitation that in use surface colours chosen would need to be accurately reproducible from specifications and free from fading. It was agreed that it was impracticable to have two methods of specifying colour rendering properties and that

Left, Miss Tilleard, Prof. Wright (GB) and Dr. Judd (U.S.A.); Centre, Lou Barbrow, Ruby Redford, Ward Harrison, Syl Guth (USA); Right, A. G. Higgins, M. D. Stonehouse, W. E. Harper, Andre Boereboom, N. Boydell, H. Carpenter.

work should continue to ascertain which of the two methods should be adopted. In the meantime, however, it is likely that some modifications to the 1948 spectral band method will be recommended. These decisions were confirmed at the formal meeting at Brussels.

Papers on colour rendering were given by Gunter Wyszecki (Canada), Takashi Azuma and Leo Mori (Japan) and Irmgard Hennicke (Germany).

Colours of light signals

The report on this subject, which had been prepared by Great Britain and was presented by Mr. B. Boorman, took the form of recommendations for the colours of light signals in terms of chromaticity limits chosen as a compromise between reliable colour recognition, reasonable visual range and practical precision of manufacture. These limits were recommended for international adoption, being broad enough to permit national specifications to adopt rather narrower limits if desirable to suit national practice. The recommendations referred to all forms of light signals used for rail and road traffic, marine and air navigation and for other purposes. In the discussion of the report the chairman made it clear that the committee was concerned only with measurements in the laboratory under standard conditions; some speakers thought that the colours in question might vary under service conditions. Mr. Tarrant (Great Britain) referred to train accidents which had apparently been caused by engine drivers mistaking the colours of signals and suggested that useful work might be done on the causes of such errors.

Gen. Wiener speaking at the banquet given by The Belgian National Illumination Committee; right, Dr. Walsh replying to Gen. Wiener.

Visual Problems

The CIE has always given prominence in its discussions to visual problems associated with lighting and under this heading we shall deal with the reports of the W-committees on visual performance, pre-determination of illumination and luminance, causes of discomfort in lighting, and agreeable luminous environment. Also under this heading comes the report of the S-committee (now to become an E-committee) on photopic and scotopic vision. The various papers which come within the scope of all the above committees are also dealt with below.

Photopic and scotopic vision

The report on this subject had been prepared by Russia but in the absence of Prof. Jurov it was presented by Dr. Arnulf (France). The report was divided into sections dealing respectively with (i) the results of experiments to obtain more precise numerical data for the relative luminous efficiency of monochromatic radiation, (ii) data on the relation between luminance and brightness, indicating departure from the additivity law when applied to brightness, (iii) the main physical and physiological investigations carried out on the mechanism of the eye's reaction to radiations of different spectral composition, and (iv) recommendations.

A clear distinction has again been drawn between "luminance" and "brightness." Whilst brightness (or luminosity) is a sensation which for a given physical stimulus may vary over a wide range depending on the conditions of observation, luminance represents an additive property of prediction which is defined on the basis of the well known expression $\int P_\lambda V_\lambda d_\lambda$ where P is the radiant flux per unit solid angle and per unit projected area, and V_λ is the relative luminous efficiency of the CIE standard photopic observer. Consequently it has now been recommended that the official definition of luminous flux which still refers to the concept of visual sensation be modified to make it perfectly clear that luminous flux is nothing less than radiant flux measured by an ideal selective receptor representing the average eye. As far as the properties of this selective receptor are concerned it has been recommended that the values of V_λ provisionally adopted by the CIE in 1924 should continue to be used.

Visual performance

Visual performance probably created more general interest than any other single subject at Brussels. During the last few months the results of the research carried out by Dr. Blackwell in the USA and the application of them by the American IES had become known and delegates to the CIE looked forward to hearing about these things at first hand and to the lively discussion which everyone expected to follow.

Visual performance is the subject of a W-committee under the chairmanship of Mr. H. C. Weston (Great Britain), the secretary being Dr. Blackwell. The report itself was brief and to the effect that it appeared unlikely that agreement upon a table of scales of basic values of illumination (the task given to the committee when it was set up in 1955) could be expected immediately. The intention was that the committee should produce such a table on the basis of adequacy of several levels of efficiency of visual discrimination for each of a series of grades of visual task. The object is not to bring about a standardisation of recommended levels of illumination in all countries but that levels of visual performance should be adopted as primary criteria of the adequacy of illumination, and that sets of illumination values determined on this basis should be accepted as foundations upon which individual national recommendations are built. The values adopted in practice might well continue to differ in different countries for reasons both technical and economic but provided these reasons are understood the perplexities now existing amongst users due to different recommended levels need no longer arise.

In presenting his report Weston proposed that for the majority of visual tasks all that was required was a standard level of amenity lighting. For the remaining visual tasks where a visual performance of near 100 per cent might be adopted for the easier ones and not less than 90 per cent for the very difficult ones, he proposed a standard luminance curve which he said would provide a badly needed common basis and avoid the differences which now exist and which tend to discredit all lighting codes. Working within its proposed limits all practical luminance values would fall between 7 and 450 ft-L.

Dr. Blackwell paid tribute to Weston's pioneering work in this field but said that in the USA they had endeavoured to take this work further and had therefore isolated aspects of the visual problem so as to assess how particular tasks are affected, and so that appropriate levels of illumination could be found for different tasks under different conditions. He felt that the results he had obtained could be closely related to Weston's linear curve. Blackwell had taken 99 per cent accuracy and a speed of 1/5 second (or 5 assimilations per second—though some speakers in the discussion did not think these were the same thing). Blackwell said that his lowest recommended luminance was 18 ft-L against Weston's 7—which he considered fairly close agreement. In fact he thought that if the committee could continue its studies for another four years it could produce an agreed basis for illumination levels.

H. C. Weston (GB) and H. R. Blackwell (USA) hold the stage on visual performance.

There was considerable discussion on both Weston's and Blackwell's work in which it seemed that the Americans took one side and the British the other, the majority of other delegates listening with interest. In reply to Mr. Crouch (USA), Weston said that in his proposals there was no need to make a special correction for contrast because if a suitable luminance was selected the performance obtained with any contrast fell within the band-width of the criterion. His method reduces the task of the lighting engineer to its simplest form—he need only measure size and reflection factor. Blackwell in reply to questions from Dr. Weale (Great Britain) said that by "threshold" he meant a 50 per cent probability of seeing; to take account of differences in threshold seeing under laboratory conditions and in practice a factor of 15 was used. Dr. Fry (USA) asked why visual tasks should always be divided into five or more grades according to difficulty, to which Weston replied that this had merely become a habit and he personally would just as soon see the application of a formula to all grades of task.

This meeting in the main served only for the airing of views; we seem to be no nearer an international basis for codes and it is doubtful whether many countries would be willing to accept Blackwell's work, which gives such high levels of ilumination for tasks which would appear to be comparatively simple, as the basis on which to work.

Later in the session Blackwell explained (or as far as was possible in a presentation of only 20 minutes) his method in a paper entitled "A proposed general method for specifying the quantity of interior illumination from performance criteria." It is impracticable here to give an adequate summary of this paper but those who wish to study the matter in detail are referred to another paper by Blackwell in *Illuminating Engineering*, June 1959, "Specification of Interior Illumination Levels" in which the method is described in detail. In brief, however, the method involves the use of families of visual performance curves for a 4 minute circular test object and an optical device for comparing practical visual tasks with this test object. A 99 per cent accuracy level is taken and "field factors" are used to compensate for differences between laboratory and practical conditions. Some 56 practical seeing tasks suggested by the American IES had been studied in this way and illumination levels determined for each.

Again in the discussion of this paper a number of detailed criticisms of the method were made. Some delegates thought that several of the tasks which had been examined and for which high levels of illumination were recommended were impracticable (e.g., why provide thousands of foot candles to read 5th carbon copies when a better system of copying seemed to be required). To such comments Blackwell agreed that if possible one should make the visual task easier instead of providing high illumination. Other speakers pointed out that there was a danger of over-simplifying a complex matter and queried the validity of assimilations per second. Blackwell replied that for years we had been dissecting visual tasks and that assimilations per second was a sound basis for investigation. And there the matter rests for the time being.

Predetermination of illumination and luminance

This committee is concerned with methods of calculating illumination levels and luminances within installations. It is an extremely complex task and the committee of necessity has to limit itself to certain aspects of the many problems involved and for the time being is considering only rooms with parallel sides. The work now being done by the Lighting Design Data Panel of the IES Technical Committee and Waldram's work on the design of the visual field is the kind of work which this Committee is studying. Incidentally it would seem that nothing arose out of the committee's deliberations which is likely to change the course of Mr. Robinson's LDD Panel.

The report was introduced by M. J. Dourgnon (France) who is chairman of the committee which is endeavouring to collect information on methods of calculation applicable to rectangular rooms under the following three headings: (a) methods of the highest precision attainable ; (b) less rigorous methods which will enable manufacturers to give tables of utilisation factors for their fittings when used in standard arrangements in rooms of different dimensions ; (c) methods which will give reasonable approximations of utilisation factors when the tables mentioned in (b) are not available.

M. Dourgnon's own feeling at this stage of the investigations appeared to be to aim for theoretical perfection and then to devise means to bridge the gap between theory and practice. He also proposed a new approach to maintenance factor so that for any installation there would be a specified initial illumination plus a quoted maintenance factor which would take into account the conditions of operation.

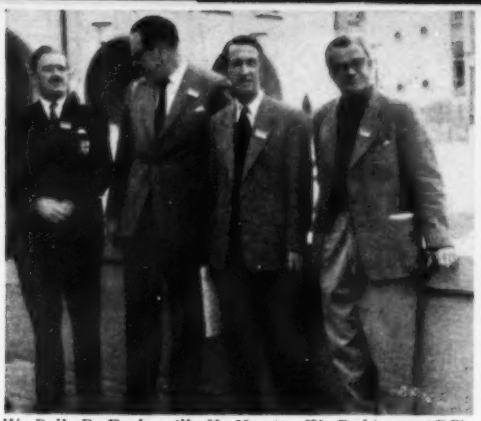
In the discussion on the report Mr. Waldram dwelt on some of the limiting factors (e.g., reflection factors are rarely uniform ; lighting engineers are not always dealing with symmetrical arrays of fittings, etc.) He did not think it was possible to work with high accuracy and the lumen method of calculation he thought was sufficiently adequate for most orthodox installations though this did not mean that gross errors in the method should not be eliminated. Support for this view came from Dr. Hopkinson who said that at the Building Research Station they used a simplified

A group including H. R. Ruff, E. B. Sawyer, G. F. Cole, P. H. Hildebrand (USA), L. B. Habro and W. Sandelin (Sweden) watch Arthur Barr (USA) demonstrate a new miniature flash bulb.

P. H. Hildebrand, Prof. E. M. Strong, C. L. Crouch, R. P. Steele (USA).

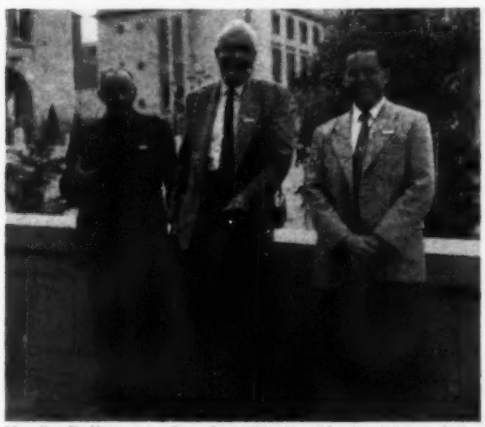
R. Pages, J. Dourgnon (France), J. W. Griffiths (USA), J. Maisonneuve (France).

A group of British delegates; L to R., J. G. Holmes, C. C. Smith, A. G. R. Farr, A. R. McGibbon, D. M. Thompson, C. Dykes Brown.

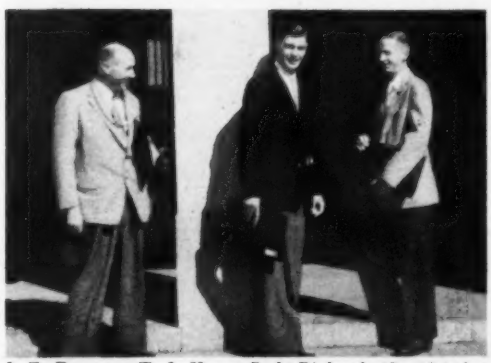


W. Bell, R. Fothergill, H. Hewitt, W. Robinson (GB).

A. H. Olson (GB), S. K. Guth, Mrs. Guth, S. G. Hibben (USA).



H. G. Fallon, A. Dresler, W. R. Blevin (Australia).



J. C. Downey, T. J. Hugo, S. J. Richards (S. Africa).

split flux method which meant that they could proceed from there to luminance design using BRS protractors. Mr. Robinson, on the other hand, advocated greater accuracy. Dr. Ward Harrison agreed that results obtained by means of the Harrison-Anderson method were liable to be low because when those tables were devised there were no cosine-corrected illumination meters available.

The immediate aim of this committee is to publish a brochure which will give descriptions of methods by which illumination and luminance can be calculated fairly rapidly, and which will also give for the benefit of manufacturers some guiding principles on the preparation of tabular data to be used by designers of installations.

In a paper entitled "Adaptation and scales of brightness" Dr. Hopkinson (Great Britain) described experiments on the interpretation by the eye of apparent brightness of any part of the scene in relation to the average level, and made proposals for standard scales of apparent brightness which he suggested might be adopted by the CIE. It was generally agreed that this was very useful work which should be developed.

Discomfort in lighting

The stated task of this committee (chairman, S. K. Guth of the USA) is the preparation of tables for the evaluation of direct discomfort glare to enable lighting engineers to design comfortable visual environments. Though the committee (and no doubt lighting engineers as well) would like to see a simple formula which could be applied to this problem, the experts on the committee are agreed that it is highly desirable to develop a formula, however complex, which is at least accurate. The lack of agreement in experimental results and the lack of certain data make it fairly certain that such a formula cannot be produced just yet. Nevertheless considerable work is going on in several countries and progress has been made in connection with a simplified discomfort glare formula for a single source and, subject to some possible modifications (e.g., for large area sources) it is likely that a formula similar to that proposed by Hopkinson in 1955 will be adopted.

It is essential, however, in any glare calculation procedure to be able to predict the degree of discomfort in a multi-source lighting installation. Various theories on glare additivity have been proposed from time to time and in a paper by Dr. W. Arndt, Dr. H. W. Badmann and Dr. E. Muck (Germany) the summation methods of Hopkinson and de Boer were analysed. This showed that though the difference between the two methods where the number of sources is limited does not exceed the experimental accuracy of determining glare, the difference increases as the number of light sources increases.

Papers relating to this subject included "The effect of specular reflection on visibility" by D. M. Finch (USA), J. M. Chorlton and M. F. Davidson (Canada), and "Disability glare; theory and practice" by J. J. Vos and M. A. Bouman (Holland).

Agreeable luminous environment

In presenting the report of this committee Mr. L. C. Kalff (Holland) said that the problems are not purely physical and cannot be solved by ordinary scientific methods of investigation. The reactions of the human mind have to be taken into account and the differences in evaluations made by different people made the committee's task more difficult. He suggested that international action should be taken to analyse existing good installations; this meant collecting a good deal of information on each installation—and establishing an international vocabulary so that adequate comparisons could be made. It would also be necessary to eliminate present misunderstandings when discussing the effects of colour. For this reason he thought it desirable to compile a colour atlas containing a limited number of colours (about 50) representative of those used in interiors in various countries and having a classification of the solid angle. The committee is trying to collect such data and at the same time is carrying out laboratory research on the same subjects.

Three exercises in the proper use of daylight. Above, in the Foret de Soignes; below, General Bernard of the Belgian Royal Military Academy explains who won and why on the battlefield at Waterloo; foot of page, on the canal at Bruges.

Daylight

Daylighting was dealt with not only as the subject of the appropriate W-committee but also in two individual papers. Numerous references were also made to daylighting at the meetings dealing with the lighting of specific types of building.

The committee meeting was concerned with a draft CIE guide to daylight calculation prepared by P. Petherbridge (Great Britain) to meet the Scope Committee's request for one or a small number of CIE recommended methods for calculating interior daylighting. The discussion was concerned mainly with the acceptance of the methods which had been selected (the Waldram diagram, the BRS sky factor protractors and the BRS internal reflected component nomograms) and with the suitability of such a comprehensive document for use by the layman. It was evident from the discussion that many countries had their own calculation techniques which they were not likely to readily abandon in favour of a CIE recommended method. On the other hand, the selected methods, although all of British origin, have already been fairly widely adopted in a number of countries. This was, in fact, one of the reasons why the particular selection was made.

Alternative techniques for the solution of daylight calculation problems had been offered by two American workers. One of these, by J. W. Griffiths, was applicable to many more sky conditions than the densely overcast, but did not meet the requirement that the reference point should be anywhere in a room of any size and configuration. The other, by P. O'Brien, was an electrical analogue computer which gave virtually instantaneous solutions to complex interreflection relationships, once the appropriate potentiometer settings had been made. However, the animated discussion on this approach to daylighting calculations failed to elucidate clearly whether at the

present stage of the instrument's development, the light from the sky, ground and opposing buildings are properly taken into account.

For the presentation of P. Petherbridge's individual paper, "Natural lighting prediction and the design of window systems for tropical climates," the Belgium weather provided appropriate climatalogical conditions. The paper showed that in building design for tropical climates, not only is the quantity of daylight more difficult to calculate, but other factors such as glare and thermal discomfort frequently have to be given the greatest attention. R. Kittler's (Czechoslovakia) survey of models and artificial skies used in daylighting research was of interest for the fact that the survey included details of many little-known daylighting studies being carried out in Eastern European countries, including a 9 metres diameter artificial sky in Moscow —the largest in the world.

Interior Lighting

For the CIE to include in its current programme a study of all aspects of interior lighting would mean a very large number of sub-committees. The actual subjects to be studied during any four year period are therefore varied according to their importance and the rate of technical development. As the main object of these studies is the collection of information, these subjects are dealt with by Secretariat Committees. Only two papers were given in this section, both being on aspects of hospital lighting, a subject which was dropped from the list of secretariat studies at the 1955 meeting but which has been reinstated for the next four year period.

Home lighting

The secretariat committee (Denmark) included in its report a schedule showing the lamp wattages (tungsten and fluorescent) used in different parts of the home in some 20 countries. The report also gives some information on the number of ceiling and socket outlets recommended in various countries. Neither of these items of information seem to add up to very much and the secretariat committee itself states that there appears to be so much difference between the types of homes and the types of luminaires in the various countries that it is very difficult to establish any generally accepted recommendations on domestic lighting. The committee further recommended that the subject be discontinued as one for special study—though in the discussion of the report the general feeling was that the work should continue.

Domestic lighting is so much a matter of personal preference that we have some sympathy with the wishes of the secretariat committee in wishing to be relieved of this task. Perhaps the most useful function of such a committee would be to collect information on the means of promoting better home lighting—a matter which seems to be given very little attention (apart maybe from in the USA).

School and office lighting

A useful report covering both of these subjects was presented by Mr. E. Paivarinne (Finland) dealing with developments and progress in some 15 countries. The report surveyed new work and new recommendations for both artificial and natural lighting, and some modern lighting schemes in new schools were discussed. There were noticeable developments in both the quantity and quality of lighting with greater attention being given to the prevention of direct and reflected glare. A number of investigations are being carried out on the control and distribution of both daylight and artificial light in schools and offices. A useful bibliography of over 100 items was given with the report.

In the discussion of this report it was thought that useful though the information that had been collected was to lighting people it would be even more useful if it could be conveyed to architects who are responsible for new schools and offices. This question of closer contact with architects either through national or international organisations is, we understand, to be considered by the CIE Scope Committee.

Left, W. T. Souter (GB), A. C. Barr, H. M. Lazerson (USA). Right, B. Knudsen (Denmark), J. Schreder (Belgium), A. S. Jannsen (Holland).

Industrial lighting

This report (prepared by Czechoslovakia) was very disappointing. It contained nothing that is not already common knowledge amongst readers of *Light and Lighting*. The bibliography (an essential part of any secretariat report) omitted much which has been published during the last four years and was unduly weighted with European publications which are not generally available. A contribution by Escher-Desrivieres (France) on the mixture of natural and artificial lighting was included as an appendix to the report though this is becoming such an important subject that it might have been given as a paper.

Attempts to make good the omissions of the report were made in the discussion. Speakers from Great Britain referred to the use of higher levels of illumination than the minima given in the IES Code, the development of trunking systems and the integration of lighting with industrial structures and even with machines. Contrary to the indications in the report itself, it was stated that there was likely to be an increasing interest in local lighting for the purpose of providing a directional component which sometimes becomes even more necessary as the general illumination level is increased. The importance of task analysis was also stressed, Dr. Hopkinson referring to the lighting of automation processes said that the people employed to supervise such plants needed to be kept very alert; the lighting therefore had to be stimulating and he foresaw the need for a careful study of such conditions in the near future.

The matter of recommended illumination levels was discussed and inevitably the new American recommendations gave rise to a number of questions. Mr. Barr (USA) said that the new higher levels in the USA had led them to wonder whether they were in fact asking industrialists to spend too high a sum on lighting; the cost of lighting per foot-candle was, however, only 1/250th of what it was 50 years ago so that even with the higher levels lighting was still very cheap. In reply to a question Mr. Barr said that the very high output fluorescent lamps had a life of about 7,500 hours and their lumen maintenance was not yet as good as normal fluorescent lamps; nevertheless even with their present efficiency they showed a saving on the cost of an installation.

Reference was also made to the high cost of providing each lighting point and the need therefore to make the best use of every one. The lighting of windowless factories was briefly mentioned and those who had experience of them said that ordinary interior lighting standards did not apply and that such factories called for special attention.

No formal recommendations were put forward by this committee but it was suggested that during the next four years the committee should consider (a) the study of visual tasks in industry, (b) a vocabulary on hazardous lighting, (c) the lighting of windowless factories, and (d) the lighting of processes involving automation.

Public buildings

This report (prepared by Italy) dealt with the lighting of museums, art galleries, exhibition halls, churches, theatres and cinemas, restaurants and bars, and included a section on *son et lumiere*. The report was well illustrated and gave in summary form a fair amount of information on lighting practice and developments in these fields in different countries.

At the meeting itself supplementary contributions were given by Mr. Rawson-Bottom on recent lighting techniques used by the Ministry of Works, by Mr. Waldram on the lighting of Gloucester Cathedral, and by Mr. Hewitt on the technical aspects of the *son et lumiere* performances in this country. Mr. Rawson-Bottom's contribution was a reminder that even in new art galleries reliance is not placed entirely on artificial lighting whilst Mr. Petherbridge referred to the studies which had led to the system of natural and artificial lighting which had been incorporated in the rebuilt rooms of the Birmingham Art Gallery.

A recommendation that hospital lighting should be the subject of a separate secretariat committee (instead of being merged with public buildings—and ignored) was eventually carried, though not before there had been some confusion caused unwittingly by the enthusiasts for the aesthetic merits of *son et lumiere* whose eloquence the advocates

Left, G. Leblanc (France), F. J. Trotman, K. R. Ackerman, P. Cahill (GB); centre, J. B. de Boer (Holland), F. C. Breckenridge (USA); right, W. E. Rawson-Bottom and H. C. Weston whose awards of the MBE and OBE respectively were announced at Brussels.

At lunch at La Reserve at Knokke; left includes M. and Mdme. Boereboom, Mrs. H. Carpenter, Dr. and Mrs. Wellwood-Ferguson and G. F. Cole; right includes M. and Mdme. Le Grand, M. and Mdme. Chappat, M. and Mdme. Clausset, M. and Mdme. Lousberg, M. and Mdme. Massart.

of a hospital lighting committee found almost frustrating.

The two papers on hospital lighting were "Lighting in Operating Theatres" by Dr. Mans, J. Blin, Henri Maisonneuve and R. Pages (France), and "Hospital Lighting" by J. Musgrove and W. J. Wellwood Ferguson (Great Britain). The French paper referred to the need for a joint analysis by surgeons and lighting engineers of surgical procedures so that lighting requirements could be defined. The British paper suggested that there was still a need for an efficient low cost suspended operating theatre fitting which would incorporate the stringent precautions needed against anaesthetic explosions. The paper also dealt with the work of the Nuffield Foundation and the Building Research Station to establish principles of hospital lighting and the view was given that to take equal account of the needs of patients and hospital staff, visual comfort and room character are of greater importance than illumination levels.

Lighting for selling

The French title of this committee is *Eclairage des Magasins* and the report is concerned solely with the lighting of shops and shop windows. However, as the emphasis of such lighting has clearly turned from lighting for seeing the goods to be sold to positive lighting to promote selling the English title is just as informative as the French. No really outstanding developments during the last four years are recorded and the tendency in almost all applications is to use a combination of fluorescent and tungsten lamps. There still, however, appears to be a need in many countries for more information to guide designers in the choice of light sources for different types of shops and merchandise. Colour-rendering in shops would seem to have been improved with the introduction of the de luxe type tubes. With the increase in illumination levels in shops the quality of the lighting is receiving more attention. Colour is becoming increasingly important and more use is being made of solid colours instead of the pastel shades which were popular a few years ago.

The report was presented by Mr. Richards (South Africa) who said that it was desirable to collect more data on the deleterious effect of light on merchandise. He also said that it was generally thought that luminous ceilings needed to be broken up in some way or other.

On the maintenance of shop lighting installations a speaker from Holland said that this was considered to be a job for a special contractor; Mr. Willard Brown (USA) said that there were now more than 50 companies in the USA specialising in this type of work, some of whom sold and maintained the complete installation so that all the shop-keeper had to do was to provide the current. Mr. Olson (Great Britain) referred to shop window reflections and attempts to reduce these by using translucent illuminated window backings though these tended to put the goods into silhouette and to attract the eye away from the goods.

Lighting for photography, cinema, TV and stage

This report was prepared by Great Britain and suffered from the lack of any information from the USA and from the USSR. Nevertheless the report gives a fair picture of progress in these fields during the last four years. Little change was to be reported in lighting for still photography but in film studios the larger sets now encountered for wide screen productions require intensities of over 1,000 lm/ft^2 which, together with new film stocks for use with tungsten filament lamps, has led to the use of 20kW tungsten lamps. Variation in colour temperature rating of incandescent lamps causes some difficulty and a recommendation was made that such lamps should be designed to operate to within plus or minus 75°K of their objective values. Speakers from the USA and Germany thought that such toler-

ances would be impracticable and preferred plus or minus 100°K. It was also pointed out that reflections had considerable effect on colour temperatures. It was reported that a new colour film stock now being used in the USA was so fast that it was possible either to reduce the level of illumination on the scene or to stop down the camera lens to get greater depth of focus.

With regard to television studio lighting it was stated that TV studios seemed to be throwing over their dependence on film studio and theatre lighting techniques and formulating more exactly their own special requirements. Details were given in the report of lighting equipment and methods of control now being used in Great Britain. In the discussion on this section of the report reference was made to silicon control rectifier dimming which appeared to show great promise though some problems have yet to be solved, and to a punched card system of setting. Mr. Ackerman said that the problems of TV studio lighting were not now so much the provision of proper lighting as in the handling of equipment. Electric hoists, he said, could reduce man-power requirements by as much as 50 per cent. Light weight lanterns made of glass fibre could also ease the handling problem. Mr. Freund (USA) said that with colour TV about three times as much light was needed as with monochrome and he mentioned the use of venetian blinds for dimming purposes with colour TV instead of dimmers which affected colour temperature.

The silicon control rectifier dimming system was also mentioned in connection with theatre lighting, Mr. Kliegl (USA) pointing out that such dimmers were very light and compact which meant that they could be used in places (e.g., night clubs) where it was not possible to install other types of dimming equipment.

Street Lighting

The report of the W-committee on street lighting, of which Mr. Waldram (Great Britain) was chairman, reviewed street lighting practice in some 14 countries and discussed the various street lighting codes which have been adopted. The main differences in practice exist in the Continental use of cut-off, sometimes with little other control of distribution, and the practice in Great Britain, USA and USSR where cut-off is not used but where the light from the lanterns is often carefully controlled.

During the presentation of the report Mr. Waldram mentioned that a report on street lighting and the reduction of accidents was now before the Scope Committee of the CIE—presumably to be published some time in the not too distant future.

It was unfortunate perhaps that the discussion of the report was concerned mainly with the experimental installations intended to compare Continental (cut-off) practice and British (non cut-off) practice which have recently been erected through the co-operation of the Belgian Ministry of Works on two similar and parallel stretches of road on the outskirts of Brussels. Mr. Waldram made it clear that neither of these installations was yet working properly and that it would therefore be premature to try to compare them. This, however, did not prevent many delegates from making the comparison and jumping to conclusions. It was also unfortunate that a visit to these installations had been included in the programme later in the session. When the programme was drawn up it had been expected that the experiments would have progressed further. As it was most people who saw the installations tended to compare the British system unfavourably with the other on the grounds solely of glare without having the other essential data (e.g., the economics of the two types of installation) which are required before voting for one or the other.

Papers on street lighting included the appraisal of quality based on road surface luminance and glare by J. B. de Boer, F. Burghout, J. F. T. van Heemskerck Veeckens (Holland), the new Swiss street lighting specifications by R. Walthert (Switzerland), and the influence of the dimensions of lanterns on quality by Paul Massart (Belgium).

Left, A. Boereboom, Mrs. Sawyer, Mdme. Boereboom and J. M. Waldram at Bruges; right, in the courtyard at the Rubens House at Antwerp.

Left, some hot and thirsty British delegates; right, some cool and quenched Scandinavians and Finns.

Transport

Under this heading are included the work of four W-committees dealing respectively with aviation ground lighting, airborne lighting and signals, automobile headlights and signal lights, and the S-committee dealing with lighting for transport other than automobile and air.

During the past ten years or so, aircraft have become larger and more difficult to handle and approach speeds have increased. New electronic aids to landing have been developed but in spite of this there is a greater need than ever before for well-designed visual aids—mainly because about 20 per cent of landing accidents are due to visual misjudgments in good weather. Much attention has been and is still being given by the committee to the use of flashing lights which have been used in the USA and information is still being collected. The committee points out, however, that the object of lights is to give the pilot information as to where he is and where he is going. The first is obtained from the instantaneous shape of the perspective image and the second from the way in which it is changing, i.e., from the streamer pattern. It has been suggested that the use of sequence flashing impairs both these indications and therefore impairs the guidance obtained from the lighting system once it is seen. The new two-colour glide path indicator developed at the RAE in Great Britain is also being studied.

On the subject of airborne lighting it would seem that the most pressing problem is concerned with the external lights designed to reduce risk of collision. Certain lines of study have been agreed and a number of official organisations and countries are taking part in the investigation.

Following international experiments, standards for a unified European headlight for road vehicles have been defined and have already been accepted by a number of countries. Work has also been undertaken to make possible the use of these headlights in countries where the left-hand rule of the road applies. As the double sealed-beam headlight (four headlights as now used in the USA) does not conform with the regulations now in force in certain European countries, work is in progress with the object of specifying substitute headlights which will satisfy the requirements laid down for the unified European beam. The committee has also standardised the form of presentation of the photometric characteristics of headlights and has prepared documents on the alignment of headlights. Work on headlights for use in fog continues.

On lighting for transport other than road and air it would seem that few developments have taken place since the last report in 1955. In general, illumination levels both for indoor and outdoor installations are being increased and installations are being modernised with more efficient lamps and lighting equipment. It is interesting to note that the committee has considered the improvement of lighting in railway carriages and recommends not less than 15 lm/ft^2; their report, however, indicates that reading might be made easier if carriage suspension was better.

Other Subjects

Not all the subjects discussed by the CIE will fit conveniently into general headings and their inclusion in this final section of our report does not mean that they are of lesser importance.

For example the work of the committee on definitions and vocabulary is of the greatest importance if there is to be any international understanding at all. The first volume of the 2nd edition of the lighting vocabulary was issued in 1957 and gave terms in the three official languages (English, French and German) and the second volume giving terms in Danish, Spanish, Italian, Dutch, Polish, Russian and Swedish is now being prepared.

The measurement of light is also a matter which is fundamental to the CIE and the laboratory experts had quite long discussions at Brussels in endeavouring to iron out their problems. When they are talking of photometric standards they are, of course, speaking in terms of very great accuracy—but it would appear that there is still some tightening-up to be done in some countries on the magnitude of the candela and of the lumen as they are represented by incandescent secondary standard lamps in their national laboratories. It is also recommended that work should continue to reach greater international uniformity in the secondary photometric standards as they are realised in discharge lamps or fluorescent lamps. A paper on total flux measurements on fluorescent lamps with an integrating sphere and a monochromator was given by M. Nonaka (Japan).

Left, "The entry of the gladiators" at Wieze; right, some of the hostesses of the City of Brussels who smoothed the path of delegates.

The committee on education of schools under R. Spieser (Switzerland) is engaged in collecting as much information as possible on courses of study, literature, visual teaching material, etc., which it hopes eventually to make available to member countries of the CIE. An exhibition of some of this material was arranged at Brussels.

The committee on lighting legislation was concerned also with lighting codes and recommended practices. From the discussion on the report presented by Prof. Tchetchik (Israel) it would seem that there is very little legislation on lighting matters most countries preferring to encourage the preparation and general adoption of codes of good practice. As such codes come within the scope of other committees dealing with lighting practice this particular committee has been deleted for the ensuing CIE session.

The report on lighting for indoor and outdoor sports surveyed current practice in many kinds of athletic activity but on the whole it did not seem that there was any startling progress to be noted. In the case of outdoor sports there was general agreement with the opinion of the British delegates that the most effective and direct way to specify lighting is to indicate the applied load. No mention was made in the report of the popularity of floodlit tennis courts in Australia—which is thought by some to be the reason why Australia always does so well in the Davis Cup, and is likely to do so for many years to come.

Developments and trends in mine lighting were fairly well covered in a report prepared by Belgium which included sections on research on the safety of lighting equipment and into seeing conditions in mines. It was reported from the USA that it had been established that instant-start fluorescent lamps are intrinsically safe and can be used for underground lighting. Mr. Strachan (Great Britain) said that tests in his country had shown that with hot cathode lamps the discharge itself was not capable of igniting a methane-air mixture but that the hot cathodes themselves were a possible source of ignition should the lamp be broken under starting conditions; tests on cold cathode lamps indicated that they would not lead to ignition. Nevertheless in Great Britain the practice was to use flameproof fittings since there was a risk of sparking at lampholder contacts and it was necessary to make proper provision for the termination of the incoming cable.

From the USA it was also reported that the Bureau of Mines had developed a photographic flash unit for underground photography in gassy mines. Poland reported that trials of coalface lighting were being carried out using instant-start fluorescent lamps coupled "magnetically" to the supply cables. It was understood that similar lamps, a 40-watt and a 10-watt, were being used in Russia. Additional subjects to be studied by this committee during the next four years include the development of lighting apparatus for cinematography and television, particularly in gassy mines, and the application of radio-active krypton filled lamps for underground use.

Visits and Social Functions

Mention has already been made of the visit to see the trial street lighting installations near Brussels. This took place on an evening which also included a visit to the Brussels airport and during the course of which a number of typical street lighting installations in and around Brussels were seen.

Delegates also had the opportunity of visiting one of the following three factories: the ACEC factory at Charleroi, the Schreder factory at Liege, or the Philips factory at Turnhout.

The social functions which had been arranged every day during the first week of the conference were an undoubted success and will long be remembered by all who took part in them. Most of them gave delegates relaxation during the evenings but tours were also arranged on the Saturday afternoon and all day on the Sunday. They included a reception at the Hotel de Ville, a concert by candle-light, the official banquet given by the Belgian National Committee, a special performance of the ballet, and a visit to the battlefield at Waterloo. On the Saturday afternoon a trip was made to the Belgian wine producing district—something quite new to the majority of delegates who were surprised to see so many glasshouses. Another afternoon excursion was to Antwerp with an evening cruise on the river Schelt. On the Sunday a large convoy of coaches took delegates to Knokke for lunch following which a visit was made to Bruges with dinner in the evening at a brewery at Wieze. Much could be written about these events (particu-

The new CIE President, Ivar Folcker, and the retiring President, Dr. J. W. T. Walsh.

larly about the last one) but those who took part need no reminder of the pleasure they had. On the Tuesday evening of the second week the foreign delegations were very pleased to entertain their Belgian hosts to dinner.

Closing Plenary Meeting

The chair at the closing plenary meeting was taken by the President, Dr. Walsh, who expressed the thanks of all delegates to the Belgian National Illumination Committee and to General Wiener for the excellent arrangements they had made for the meeting. He also thanked the organising committee and M. Boereboom and his assistants for their very efficient handling of the programme including the social events. Dr. Walsh also thanked the Ladies' Committee for the excellent programme they had arranged for the ladies, the staff of the Palais des Congres and the Brussels Hostesses who had done so much to help delegates and to cope with the many languages. Dealing then with CIE matters Dr. Walsh expressed his appreciation of the work done by the officers and members of standing committees and in particular that by the Secretary, Prof. Yves Le Grand and M. Jean Chappat who were continually working for the benefit of the CIE.

Then came the presentation of scrolls to Past-presidents of the CIE. Dr. E. P. Hyde (1921-27) and Prof. Meyer (1927-39) were unfortunately unable to be present but Dr. Walsh was able to make the presentations personally to Dr. Halbertsma (1939-51) and to Dr. Ward Harrison (1951-55).

Dr. Walsh then announced that the Executive Committee put forward the nomination of Mr. Ivar Folcker, of Sweden, as the President of the CIE for the next four years. This nomination was approved with acclamation and Mr. Folcker assumed the chair. In acknowledging his acceptance of office Mr. Folcker said that though he considered himself hardly qualified to follow such eminent men as had been presidents of the CIE he would do his utmost to further its objectives during his term of office. As his first duty he presented to Dr. Walsh a scroll recording his period as President and his long service to the CIE. Mr. Folcker recalled that Dr. Walsh had served the CIE for many years as secretary, as a vice-president, and as a member of most of the standing committees. During his period as President he had been responsible for the reorganisation of expert and secretariat committees.

Finally it was announced that the next meeting of the CIE would take place in Vienna in 1963.

List of committees and secretariat countries, 1959-63

Number	Subject	Secretariat Country
E 1.1	Definitions and Vocabulary	France
S 1.2	Measurement of light	Japan
E 1.3.1	Colorimetry	USA
E 1.3.2	Colour rendering	Germany
E 1.3.3	Colours of light signals	Great Britain
E 1.4.1	Photopic and scotopic vision	USSR
E 1.4.2	Visual performance	Holland
S 2.1.1	Sources of visible radiation	Sweden
E 2.1.2	Sources of UV and IR radiation	Germany
S 2.2	Characteristics of lighting materials	Austria
E 3.1.1.1	Pre-determination of illumination and luminance	France
E 3.1.1.2	Causes of discomfort in lighting	USA
E 3.1.1.3	Pleasantness in lighting	Holland
S 3.1.2	Lighting of homes, schools, offices, public buildings, hospitals; lighting for selling, for transport, for sports; floodlighting and *son et lumiere*	Jointly by: Denmark Finland Iceland Norway Sweden
S 3.1.5	Mine lighting	Poland
E 3.1.9.2	Lighting for photography, cinema and television production and theatre stages	Great Britain
E 3.2	Daylight	Australia
E 3.3.1	Street lighting	Belgium
E 3.3.2.1	Aviation ground lighting	Great Britain
E 3.3.3	Airborne lighting and signals	USA
E 3.3.5	Automobile headlights and signal lights	France
E 3.3.7	Signal lights	Germany
E 4.1.1	Education in schools	Switzerland

Karl Siberg (Finland) and Bent Knudsen (Denmark) toast the Brussels meeting—and the next one in Vienna in 1963.

IES Golden Jubilee

Overseas visitors tour

TO enable its overseas members to participate in its Golden Jubilee celebrations The Illuminating Engineering Society arranged a three-day series of visits in and around London during June 11-13. The date was selected to enable the many people from all parts of the world who would be attending the CIE meeting in Brussels later that month to take part. In fact there were 77 visitors from 20 countries, the latter being Australia, Austria, Belgium, Canada, Czechoslovakia, Denmark, Finland, Germany, Holland, Iceland, Israel, Italy, Japan, Kenya, Norway, South Africa, Spain, Switzerland, the USA and Yugoslavia. The programme for the three days was planned to include both visits of technical interest and visits to places of more general interest but which are not normally seen by visitors from overseas.

Some of the visitors at the reception on the first day. L. to R, Prof. Matanovic (Yugoslavia), Mr. Penny, Mr. Olson, Mr. Page, Prof. Tchetchik (Israel), Mr. Campbell, Mr. Aspestrand (Norway), Mr. Wakefield (USA), Dr. Richard (Italy), and Mr. Sawyer.

Mr. Penny briefing the visitors at the BLC before leaving for Crawley and Gatwick.

On the first day participants met at the new London premises of the British Lighting Council where they were welcomed by Mr. H. G. Campbell, President-elect of the IES, and by Mr. A. E. Page, Deputy-Chairman of the BLC. The party then left for Crawley New Town and Gatwick Airport making a slight detour on the way to have lunch at Burford Bridge Hotel at the foot of Box Hill in Surrey. After lunch the party divided into two, one group going to Gatwick and the other to Crawley with a change over after tea which was provided by the Crawley Development Corporation at their headquarters at Broadfield.

At Gatwick excellent arrangements had been made jointly by the Ministry of Transport and Civil Aviation and Frederick Snow and Partners, who were the consulting engineers for the Gatwick project. The visitors were able to see the functioning of the airport including the integration of air, road and rail transport which is a feature at Gatwick. They were also able to study the architecture and lighting of the terminal building. As it was not possible to tour the airfield a display of lighting fittings used for approach lighting, on the runway, apron, etc., was arranged in the terminal building itself.

At Crawley the visitors were taken on a tour of the new town and were able to see the residential neighbourhoods, the industrial estate, a considerable amount of building of all types, and to make a tour on foot of the town centre. The visitors were most impressed with the latter—as also were



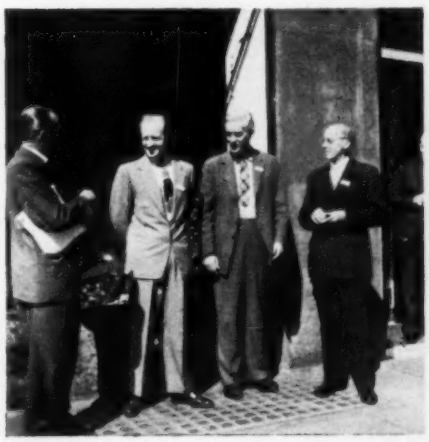
During the tour of Crawley. Left, Mr. Ranta (Finland), Mr. Sagoo (Kenya), and Mr. Hartile. Centre, Mr. and Mrs. Christiansen and Mr. and Mrs. Ovesen (Denmark). Right, Mr. Milne (Chief Engineer, Crawley Dev. Corp.), Mrs. Penny, Mr. Fallon (Australia), Dr. Ballin and Mr. Aspestrand.

those IES stewards who had not previously visited Crawley. Guides provided by the Crawley Development Corporation gave excellent running commentaries during the tour. In the evening both groups joined up again at Gatwick where they had dinner before returning to London.

The following day was an exceptionally busy one as it included visits to the new BBC Television Centre and the Riverside TV studios in the morning, the Research Laboratories of the General Electric Co. Ltd., at Wembley, in the afternoon, a tour of the Houses of Parliament with dinner in the Members' Dining Room (arranged by Mr. Charles Royle, M.P.) in the evening followed by a trip down the river to see the floodlighting and the Pool of London by night. The day started at 9.30 a.m. from the rendezvous at the BLC and finished at 11.30 p.m. For the visit and the dinner at the Houses of Parliament the ladies (who had been excluded from the technical visits during the day) joined in once more and a very enjoyable and memorable evening was had by all.

On the last day (Saturday) visits were made during the morning to the TUC Memorial building and to Thorn House. The latter was a most interesting visit as the building was in various stages of completion.

The series of visits was brought to a very satisfactory close by lunch at the Tallow Chandlers' Hall in the City of London with Mr. A. G. Penny, Chairman of the IES Jubilee Committee, in the chair. At the conclusion of the lunch Mr. A. S. Janssen, on behalf of all the visitors from overseas, thanked the IES for the excellent programme and hospitality which had been provided and congratulated the society on the organisation which had enabled the programme to run so smoothly throughout the whole period.




Left, Mr. Rous (Holland), Mr. Ranta, Dr. Strange and Mr. Leuch (Switzerland). Right, a group outside BLC headquarters.


Left, Mr. Azuma, Mr. Onozuka, Mr. Hinonishi and Mr. Imura, of Japan. Right, Mr. Hrabalek, Mr. Svehla and Mr. Krtil, of Czechoslovakia.

IES Golden Jubilee—Overseas visitors tour

Above, two groups at the GEC Research Laboratories; left, Mr. Tielemans (Denmark), Mr. Lippestad and Mr. Eger (Norway), Mr. Hoefler (Austria), Mr. Beggs (GEC), Mr. Aspestrand, Mr. Krones (Austria) and Mr. Rouly (Belgium). Right, Prof. Beck (Germany), Mr. Ruzic and Mrs. Sain (Yugoslavia), Mr. Kempf (USA) and Mr. Ker (South Africa).

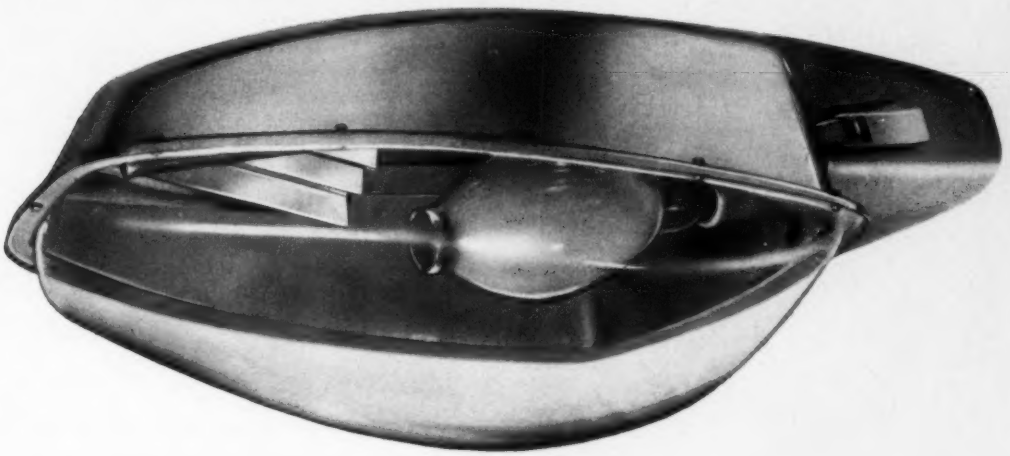
Right, a group during the visit to the TUC building.

Below, left, Mr. and Mrs. W. E. K. Middleton (Canada) and Mr. A. S. Janssen (Holland).

Below right, a group of visitors at Thorn House.

There is no doubt that all the visitors thoroughly enjoyed themselves and were glad of the opportunity not only of taking part in the IES Golden Jubilee but of seeing many interesting aspects of lighting research in this country. They were also particularly pleased by the way in which technical matters had been integrated into a programme which also enabled them to see so much of the British way of life and tradition.

The Norwich Experiment!



civic trust chose atlas alpha III lanterns

The most advanced street lighting lantern in its class, the Atlas Alpha III colour corrected mercury vapour lantern was selected by the Civic Trust for the lighting of Magdalen Street, Norwich. Unobtrusively mounted on wall brackets, these lanterns present a pleasing appearance that is completely in harmony with local characteristics. Excellent design features and solid construction are an assurance of trouble-free installation and minimum maintenance; and performance reaches the highest standards of efficiency.

Atlas Lighting Limited, A subsidiary company of Thorn Electrical Industries Ltd., Thorn House, Upper St. Martin's Lane, London, WC2

The Norwich Experiment

THIS is the story of an experiment in civic design. It is also a story of civic co-operation in which self-help was seen to be synonymous with public spirit. To bring it about, some eighty property owners and occupiers in a single length of street combined to give that street a new lease of life ; to their efforts were joined those of the Local Authority, the Ministry of Transport, the local bus company, the Civic Trust and some twenty architects and designers. The street was Magdalen Street, Norwich. The authors of the 1945 City of Norwich Plan regarded Magdalen Street as ' so important to the general character of Norwich, and in particular to the appearance and quality of the north side of the City, that . . . every effort should be made to preserve it and, in the future, to control development and restoration throughout [its] length . . . ' At the same time, Magdalen Street could be said to be typical of mile upon mile of shopping street throughout the country and any lessons learnt there seemed likely to be capable of wide application elsewhere. In the street are branches of the big multiple stores, local shops large and small, several banks, several public houses and two churches. Like so many other streets throughout Britain, it had slowly, through the years, through carelessness and thoughtlessness and haphazard development, lost much of its charm and air of importance. What was needed was for the street to be studied once more as a whole—a problem that faces us at every turn in our cities, towns and villages today. Overall schemes of exterior decoration have been undertaken in the past with properties in a single ownership—the Norwich City Council, indeed, have done just this with conspicuous success in Elm Hill, all the buildings of which are in the possession of the council. Such an experiment, however, has never been attempted, so far as is known, in the much more complex conditions presented by multiple ownership. Herein lies the interest of the scheme.

Above, night view from St. Saviour's Church, with bus shelter in foreground lit by twin 6-watt fluorescent bulkhead units. Opposite page, during the course of the work—removing one of the old street lighting standards.

THE initial need was for information. To this end the City Engineer and Planning Officer's Department (H. C. Rowley, M.I.C.E., M.I.Mun.E., City Engineer and Surveyor) undertook a full photographic survey of the street, building by building. A local architect, Bernard Feilden, A.R.I.B.A., A.A.Dipl. (Hons.), was now appointed by the Trust to work with the consulting and co-ordinating architect, Misha Black, O.B.E., F.S.I.A., M.Inst.R.A. To the photographic record were added certain measured drawings and, on this basis, were drawn up generalised principles of approach to the problem, together with more detailed proposals for some half-dozen properties. The Trust undertook, where appropriate, to meet the architectural and design fees involved, while the architects aimed to bring the cost of physical work proposed for individual premises, which would have to be paid for by the owner and/or occupier concerned, to within the range of £50-£150.

In the meantime, the City Planning Officer had begun, informally, to sound out a few of the larger traders and landlords in the street. About ten were invited to a preliminary meeting and at a subsequent larger meeting at the City Hall an exhibition was mounted, showing the proposals visually, and speakers included the Lord Mayor, Misha Black and the Director of the Civic Trust. Each representative attending was given details of the scheme, a survey photograph of his own premises, and a questionnaire. The 'feeling of the meeting' proved to be overwhelmingly in favour of the scheme, and, within a fortnight, three-quarters of the traders had signified their readiness to co-operate.

Four more local architects—Derek Bond, A.R.I.B.A., Mrs. Sheila Gooch, A.R.I.B.A., Barry Hastings, A.R.I.B.A., and Edward Skipper, A.R.I.B.A.—were appointed to help Mr. Feilden on proposals for firms not employing their own architects, and Mr. Black then prepared a manual for the guidance of all working on the scheme. This manual was based on ideas formulated at the City Hall meeting. It included two groups of recommended colours, taken from the B.S.I. range; seven samples of materials for shop window blinds and eight samples of curtain materials for upper floor windows. Guidance was also offered on other finishes and on exterior signs, and 13 recommended alphabets for use on fascias, etc., were shown, though it was not suggested that all existing lettering should necessarily be changed. The essential purpose of the principles enunciated was not to impose a monotonous conformity upon the street but to establish certain limits of visual good manners within which the utmost diversity could be aimed at.

During the summer of 1958 the local architects associated with the scheme each took a group of properties and evolved their detailed proposals for individual buildings. These proposals were formulated after consultation with the owners and tenants of the properties concerned to ensure that the schemes were practicable. In October, the architects appointed by the Trust brought their proposals together for co-ordination and joint discussion at a three-day conference with the co-ordinating architect.

A second submission to Mr. Black for final approval

Left, old street lighting standard seen in photograph taken before work commenced. Below, part of the street after completion of scheme, showing position of new street lighting bracket and wall mounting of " no parking " sign.

took place three weeks later and the proposals were then put out to local tender.

Very little ' cost resistance ' was met except from the smallest traders, though a good deal of time had to be spent by the architects in personal contact with individual owners and occupiers. In discussing proposals with individual traders, many of whom were unused to the problems involved, it was found helpful to be able to show them details of the rest of the scheme at the same time. Knowledge of how their own buildings would fit into the street as a whole, gave them confidence in discussing their particular problems.

While this work was going on parallel discussions were taking place between the co-ordinating architect, the City Engineer and the Chief Electrical and Lighting Engineer of the Corporation, D. Clark, Dip.M.I.E.S., about proposals for relighting the street, redesigning and planting a waste lot, the erection of new bus shelters and crush barriers, the removal of certain items of street furniture and the reconsideration of certain small items, such as the lettering on litter bins. With the City Engineer, joint discussions took place with representatives of the Ministry of Transport about the possibility of removing certain traffic signs and redesigning others. Discussion also took place with the local omnibus company, which agreed to erect new ' stop ' signs of the Trust's design and with Messrs. Radio Relay about rerouting the overhead wires which crossed the street at several points. Work began in the spring of 1959 and was completed in about two months, no special problems presenting themselves during the actual execution of the project.

What does the Magdalen Street project amount to ? For the record, 66 properties facing the street, and two or three others visually affecting the street, together with a number of alleys and courtyards were repainted ; 17 fascia boards over shops were amended in size and 38 were relettered ; 22 projecting signs and advertisements were removed ; 26 shops installed new blinds and 16 new curtaining ; 6 lamp standards were removed and replaced by 16 Atlas 'Alpha 3 ' colour- corrected mercury lanterns bracketed from the buildings ; 3 new cantilever bus shelters of the standard city design were erected and 5 new ' stop ' signs superseded 8 old ones ; 11 pairs of ' No Waiting ' and ' No Loading ' signs were redesigned as one and a further pair was removed altogether ; cornice lighting was installed on one building and floodlighting at another ; and some 40 other structures and objects in the street were removed, replaced or repainted.

Many of these details will not be readily apparent to the casual passer-by, though certainly contributing to the changed appearance of Magdalen Street. The first impact upon the stranger will doubtless be the strong colours and the gay effect of the street as a whole. Those who knew the street before will perhaps find it more restful than it used to be and will appreciate the added sense of spaciousness achieved, not only by lighter colours, but by the removal of wires and lamp-posts and other dis-

tractions. One citizen said that the street 'looked half as wide again.'

The cost of the operation was split, in the main, between the owners and occupiers of the buildings concerned, the City Council and the Civic Trust. Excluding expenditure on overdue maintenance and repairs, the cost to the property owners and occupiers is estimated at £5,000. Of this about two-fifths was incurred in alterations, three-fifths in decoration. The average of less than £80 was rather lower than originally anticipated. In only four cases was estimated total expenditure greater than £175 ; in 22 cases it was less than £50. The City Council had already decided to install new street lighting and bus shelters which, together with certain other minor works carried out under the annual estimates, were to cost about £2,400. These improvements were amended to bring them into accord with the scheme as a whole. Expenditure authorised specially for the scheme amounted to some £650, of which £300 was occasioned by work at the new garden site.

Expenditure directly attributable to the Trust's proposals amounted, therefore, to less than £6,000. To this, of course, should be added the fees of the architects commissioned by the Trust. Excluding the sum of £1,000 spent on the first stage of the project up to and including the meeting at the City Hall—which the lessons learnt in Norwich might reasonably be expected to make unnecessary in future schemes—the cost to the Trust is estimated at about £1,500.

Above, close-up of street lighting lantern and bracket showing how fixing has been incorporated in architectural feature. Right, close-up showing typical concealment of services and control gear behind archway of alley leading into main road.

THE LIGHTING INSTALLATION

By D. Clark, Dip. M.I.E.S.

THE original street lighting of Magdalen Street consisted of seven 400-w HPMV lamps fitted vertically in bowl type refractor lanterns, the services and cable work being very untidy. In general, an underground service cable was attached to the outside of 27 ft. tubular steel lamp columns, and the PILCST & S service cable was contained within a protective pipe, terminating in a rhythmatic relay box. From the relay box a twin TRS cable was fixed to the outer face of the lamp column by means of black adhesive insulating tape. The tapes periodically became loose and gaily flapped in the breeze. This twin cable was connected to a further box containing the protective fuse, choke and capacitor. The cable then continued its journey up the lamp column, along the ornate bracket and into the connector box at the top of the lantern. Thus, the exposed cable perished fairly frequently.

Not all lamp columns were fitted with a separate underground service, several being connected to the electrical supply *via* overhead bare single-copper conductors. The overhead system was extremely unsightly and a constant danger, and required frequent maintenance. The average spacing of the lamp columns was approximately 200 ft. Their removal had to be carried out early on a Sunday morning because of the heavy flow of traffic at other times. The columns were cut off with welding plant 1 ft. below the footpath surface—for speed and to avoid damage to underground services. The equipment was removed only when the new installation had been put into service, so that continuity of the lighting was maintained.

Before any positions for new equipment were fixed, a joint meeting took place between the architect and the electrical and lighting engineers. From the lighting engineer's plan, approximate positions for the lanterns were transferred to the architect's elevations and, when necessary, a compromise was made to achieve good appearance and satisfactory performance. The site was then visited and positions again varied slightly to achieve a common mounting height for the brackets, while maintaining uniformity and alignment with features of the various buildings. The final positions had then to be agreed with the property owners and discussed with architects who were directly responsible for such properties as the public houses.

When the final positions had been agreed, it was necessary to decide how to conceal (1) the Electricity Board's underground services and rhythmatic relay control boxes, and (2) the Council's protective fusing, choke and capacitor, contained in a composite box. When the property owners were convinced that such equipment should not be exposed to view, they readily agreed to the suggested situations for concealing the services and control-gear boxes. They co-operated further by allowing several of the circuit cables to be installed through the backs of the lantern brackets and concealed inside the structures, the cables eventually coming through the ceilings of passages and alleyways where the control gear and/or service was sited.

Contrasting quality of street lighting before and after new installation. Positions for the mercury fluorescent lanterns were decided at joint meetings of architects, electrical and lighting engineers and agreed with property owners.

One property owner agreed to the following typical proposal: An iron ventilation grille which gave access to a cellar was removed; the street lighting service cable, rhythmatic relay and control gear were fitted on to the brickwork directly behind the position of the grille; and the grille was mounted into a new timber frame, fitted with hinges and a lock, one of the keys being given to the property owner. Another enclosure grille was fitted inside the cellar to prevent entry to the cellar from the outside. The circuit cables were concealed in the outside wall, at low level, and a hole was drilled through the brickwork to give access to the control-gear box in the cellar.

At the position where the road divides stands a bank outside of which there was a clutter of street lighting equipment and road signs. The lighting engineer suggested that there should be special lighting treatment for this building to provide pleasing "background" lighting. The structural alterations to the bank had, unfortunately, been decided before the street lighting was sanctioned. Nevertheless, the matter of built-in lighting was quickly discussed with the architect and, after a trial installation, the following layout for the front elevation was agreed. The five windows, which had been fitted with internal venetian blinds, were fixed at a slight angle to the horizontal, and a fluorescent lamp was fitted at each sill to throw light upwards on to the slats of the blinds. A high-level pelmet conceals more fluorescent lamps shining downwards and the pediment of the facade is lit by a concealed fluorescent lamp shining *upwards*. To complete the installation the columns and decorative scroll work at the entrance were picked out by means of two 150-w floodlamps with pressed glass internal reflectors. To provide colour contrast, the internal lamps are "natural," while the external ones are warm-white. The two lower windows have been fitted with a white opal "Perspex" screen at sill level—9 in. high and decorated with engraved and filled lettering. All the wiring, mainly of mineral insulated cable, is concealed in the building structure, and it is worth noting that the cost of this installation was no more than that of a conventional lighting column with a fluorescent lantern.

One part of the road was not suitable for lighting by wall brackets because the area behind the footpath was a grassed forecourt to a delightful old church. Instead, the church has been floodlit by two 140-w sodium-vapour floodlighting lanterns on the splayed side elevations. The front elevation is lit by two 250-w mercury fluorescent internal reflector lamps housed in protective metal fittings complete with spill rings. All fittings are screened from view by evergreen shrubs. In front of the church a new 'bus shelter has been erected and fitted with six well-designed fluorescent bulkhead fittings each housing two 6-w fluorescent lamps with diffusers of 040 white opal "Perspex." (See photograph on page 265). The wiring for both installations consists of pvc and armoured cable, which is concealed under the turf. The pvc cable for the 'bus shelter lighting is completely hidden within the structure.

There were two possible locations for an underground service and relay box: A separate cupboard located behind a public telephone kiosk or a loop service connection from *inside* the kiosk. After much discussion with telephone officials, the local manager agreed to allow the kiosk to be used for the street lighting relay control. A relay box was, therefore, fitted in the kiosk and connected to a separate fuseway in the Electricity Board's intake service unit. An underground box was fitted to connect the 'bus shelter and the floodlighting of the church, and a pvc armoured cable connected to the box was installed into the relay control box inside the telephone kiosk. Local fusing was provided to ensure reasonable protection and isolation of faults.

DETAILS OF EQUIPMENT

Atlas-Alpha three lantern for 250-w or 400-w mercury fluorescent lamp: The lantern consists of two parts—an hermetically-sealed lamp enclosure and light-control system, and an end support. The latter embodies a fixed lampholder and sealing cap, and a support rod for the lamp enclosure, which is a one-piece assembly comprising a deep-drawn reflector and an acrylic plastic cover. The reflector is pressed in Noral D57S sheet, electrolytically brightened and anodised (The Vulcan Stove Co. Ltd., Exeter). For the Norwich installation the outside of the reflector was given a gunmetal colour finish (BS2660 ref. Grey 9-97).

The bowl is of ⅛-in. thick "Perspex" (ICI Ltd.) shaped by Arrow Plastics Ltd., Thames Ditton. In this instance, the "Perspex" is tinted pale pink. The lantern was designed specially for use with 250/400-w mercury fluorescent lamps. It has good cut-off characteristics (essential with a mercury lantern for reasonable comfort conditions) and medium-angle beam distribution.

Light control is effected by means of a specially designed reflector which has been regarded as having side panel segments of a large paraboloid, supplemented by facets in the top section. The light output ratio is 0.78, that below horizontal being 0.76. Light output per 100 linear feet of roadway at 100 ft. spacing is 7,030 lm ; directional intensity ratio, 2.1 ; weight, 17 lb.

The lantern is mounted at a height of 23 ft. above the footpath—to achieve uniformity of mounting height and to ensure that full advantage is taken of its design. In general the spacing does not exceed 75 ft. ; hence the 250-w lamp was chosen. It was felt that such an installation would give more even distribution and more comfortable conditions than an installation using 400-w lamps. This was found to be so, and has been strongly confirmed by night motorists.

Modifications to the standard lantern were carried out at the request of Misha Black, the cost of each lantern being £16.

The wall bracket was designed specially for the installation by the lighting engineer and approved by the consultant architect. It was manufactured at one of the City Engineer's workshops. The aim of the design was to avoid the appearance of an appurtenance and to facilitate rear entry for cables. The brackets were fixed by drilling the brick or stone structures with a durium-tipped drill and using " Rawlbolts." In several instances the structures were strengthened to ensure secure fixings. The brackets were painted to match the lanterns.

Lamps : 250-w mercury fluorescent, type MBF/U; average output through life, 10,000 lumens, providing a good degree of colour correction in conjunction with the tinted " Perspex " cover. It would obviously have been more efficient if the full colour correction had been made by the light source, but the percentage loss in efficiency using tinted " Perspex " is not appreciable.

Control gear : 250-w solid-filled, with voltage tappings (Crompton Parkinson Ltd.). Unfortunately no manufacturer could offer polyester-filled gear, which would probably have been smaller and might have given better performance. The capacitor was chosen for good performance and for having an " end-on " fixing bracket to save space. (GEC Ltd., 13 mfd. Cat. No. Z.1851.) The control gear was housed in relay boxes which were in stock at the Council's stores. Each box was fitted with a single-pole fuse and neutral block.

Cables : Cables used were mainly mineral insulated with a pvc sheathing, secured by means of pvc and copper saddles. The fixing tool used was the " Hilti " pin type supplied by Ucan Development Ltd., Richmond, Surrey. This fixing tool is fitted with hardened " Hilti " non-rusting steel pins, which are easily driven directly into the brick or stone structure for saddle fixing by means of a 3 or 4 lb. club hammer, thus eliminating drilling or plugging.

THE CIVIC TRUST

The objects of the Civic Trust are, broadly, to promote high standards of architecture and civic planning in Gt. Britain, and to encourage wider interest in the general appearance of cities, towns and villages. The President of the Trust is Duncan Sandys, and its first technical advisory meeting was held in May, 1957. The various bodies represented at this meeting were the Royal Institute of British Architects, the Royal Institute of Chartered Surveyors, the Institution of Civil Engineers, the Institution of Municipal Engineers, the Town Planning Institute, and the Society of Town Clerks.

The activities of the Trust are briefly as follows :—

(i) A service of information and professional advice is made available to industry, commerce and local authorities.

(ii) Exhibitions of contemporary architecture and planning in Gt. Britain and foreign countries are to be organised.

(iii) A national forum has been created for the discussion of current developments in architecture and civic design. For this purpose, conferences of leading personalities from the professions concerned, industry, commerce, local authorities, Government departments and amenity societies will, from time to time, be convened.

(iv) Local conferences are arranged in selected towns to discuss the planning problems and potentialities of the locality.

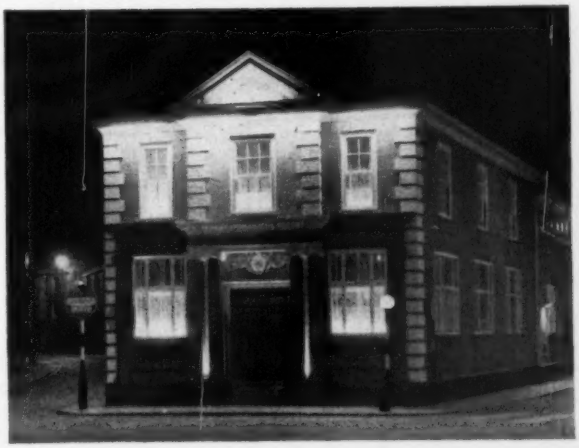
(v) Architectural and town planning competitions are sponsored on issues of public importance.

(vi) Expert studies are initiated and reports issued thereon.

(vii) Public interest is stimulated through Press, radio and television.

To carry out these tasks effectively a substantial income will be required for a number of years, the amount initially required for the foundation of the Trust being sought through seven-year covenants from leading companies to ensure its independence. The Trust will not seek financial support from Government sources, at any rate until it is fully established. The Board of Inland Revenue have verified that the Trust will rank as " a charity " for the purpose of tax exemption and refunds. The activities of the Trust are organised by a small executive staff assisted by advisory panels of qualified persons.

The author wishes to express his appreciation to the City Engineer, the Civic Trust and the Architect, Bernard Feilden, for the valuable assistance he has received, and in particular, to his colleagues for the team spirit shown.



This bank occupies the prominent site where the road divides. The top photograph shows the vicinity before improvement ; the night view shows the effect of tidying up the street signs and of a simple floodlighting installation.

Lighting Abstracts

OPTICS AND PHOTOMETRY

535.672

712. Experimental determination of the colour-rendering of light sources in general use.

H. W. BODMANN and B. JACOBSEN, *Lichttechnik*, **11**, 330-333 (*June*, 1959). *In German.*

The colour-rendering properties of an illuminant may be expressed in terms of an index based on the energy distribution over a limited number of wave-length bands (the spectral band method) or on the change of colour of certain selected objects. The authors set up two cubicles side by side and illuminated them with six pairs of illuminants. In five of these pairs the test lamp was fluorescent and in four the reference lamp was tungsten, with or without filter. Thirty-two common objects or coloured samples were placed in the cubicles and 50 observers were asked to assess the degree of colour difference on a scale of 0 to 3. The average assessment thus obtained for each pair of illuminants was then compared with the results given by the spectral band method. J. W. T. W.

535.242

713. Apparatus for determining and drawing curves of light distribution automatically.

A. PAHL and K. G. BAUMGARTEN, *Lichttechnik*, **11**, 334-335 (*June*, 1959). *In German.*

Describes an instrument based on the principle of linkage between the rotation of a lamp or lighting fitting and that of a fluorescent surface. The light from the source falls on a photocell and the photo-current, after amplification, moves a mirror by means of which a beam of light from a mercury lamp traces out the polar curve on the fluorescent surface. Polar curves in different planes can thus be drawn quickly one after the other and may be recorded photographically. J. W. T. W.

535.241

714. Measurement of the luminous flux from fluorescent lamps without using an integrating photometer.

T. OLESZYNSKI, *Archiwum elektrotechniki (Warsaw)*, **7**, 87-97 (1958). *In Polish with full English summary.*

The routine testing of fluorescent lamps involves periodical measurements of luminous flux. If these are made in an integrator, the lamps have to be removed from the racks, transported and reconnected. This may be avoided if it is assumed that the luminous flux is proportional to the luminous intensity and this, again, proportional to the luminance of the central part of the tube. The factor of proportionality depends on the length of the tube, and figures found experimentally are given in the paper. The luminance can be measured while a lamp remains on the life test rack by using a photo-electric brightness meter described by the author and illustrated in the paper. The accuracy is estimated to be about 5 per cent. J. W. T. W.

LAMPS AND FITTINGS

715. Economics of fluorescent reflector lamps. 621.327.43

C. N. CLARK and N. F. MEYER, *Illum. Engng*, **54**, 143-153 (*March*, 1959).

An advantage put forward for the use of fluorescent reflector lamps is that their light output is less affected by dirt deposition on their upper (reflector) surface. On the other hand, the presence of a luminaire reflector above such lamps can materially influence the total downward lumens. Photometric measurements on clean and dirty fluorescent reflector luminaires have enabled economic studies to be carried out. These show that under average dirty conditions, regular cleaning on an appropriate schedule will enable ordinary non-reflector fluorescent lamps to give highest maintained illumination and lowest cost of light, but that under severely dirty conditions the balance is altered in favour of reflector fluorescent lamps. P. P.

621.329

716. Multilayer polarizers and their application to general polarized lighting.

A. M. MARKS, *Illum. Engng*, **54**, 123-135 (*Feb.*, 1959).

Ordinary polarising materials transmit 35-45 per cent of the incident light, the remainder being absorbed. On the other hand, multi-layer polarisers, comprising thin sheets of transparent material such as glass or plastic film separated by correspondingly thin layers of air, used in the bottoms of enclosed luminaires with matt white interiors to diffusely redirect the reflected component, transmit approximately 70 per cent of the incident light. Numerous photometric comparisons between this type of luminaire, and other luminaires with open and normal diffusing bottoms, demonstrate the superiority of general polarised illumination for room interiors in reducing the veiling haze on horizontal surfaces and thus improving visual acuity, increasing visual threshold, increasing saturation of coloured objects and lowering ceiling luminances. P. P.

621.327.5

717. Smooth continuous control of illumination from a fluorescent lamp installation.

B. G. WICKMAN, *Ljuskultur*, **31**, 36 (*Jan.-March*, 1959). *In Swedish.*

Thyratron control permits a continuous regulation of the amount of light from a fluorescent lamp system to be achieved over a wide range. The system is especially suitable for theatres and cinema halls. The theory of the control system is explained, and the characteristics specified in terms of possible load. It is pointed out that filament lamps can be controlled by the same method, but that the same set of gear cannot be used to control mixed installations. R. G. H.

718. Planning location of luminaires. 628.972

Illum. Engng, **54**, 137-140 (*March*, 1959).

The adoption in the U.S.A. of both higher recommended lighting levels and higher output lamps has meant a return to the lumen method of illumination calculation. This method, however, determines only the number of luminaires required and not their spacing. Worked examples show how this spacing can be determined by a simple four-step procedure, the procedure using as a basis the suggested spacing between the outer rows of luminaires and the adjacent walls given in the U.S. Recommended Practice for Office Lighting. P. P.

621.329

719. Controlled fluorescent reflector design for sharp cut-off and uniform distribution.

D. E. SPENCER, *Illum. Engng*, **54**, 167-173 (*March*, 1959).

Extended light sources, such as fluorescent lamps, require for their reflector design an approach different from that for "point" light sources, the cone of light rays converging rather than diverging from the source. This principle is applied to the design of reflector contours giving a sharp cut-off and a near-uniform illumination distribution. Inter-

reflections between the reflector and the glass protective window may impair perfect cut-off unless the interreflecting surfaces are correctly orientated. A secondary reflector boosts the illumination near the lamp pole base and enables diversities of as little as 2:1 to be obtained over a distance of 60 ft. from the pole. P. P.

720. Integrated ceilings for illumination. 628.972

J. S. HAMEL, *Illum. Engng*, **54**, 229-233 (*April*, 1959).

A significant saving in running costs can be effected if the fluorescent lighting is integrated with the ceiling construction in air-conditioned interiors. Various designs of an "Integrated Ceiling System" are discussed, a particular feature being the location of the luminaire ballasts in the ventilated ceiling plenum, so reducing by approximately 17 per cent the heat gain to the air-conditioned interior produced by the artificial lighting. P. P.

621.329

721. Light directing vs. diffusing media in luminous ceiling areas.

H. A. ODLE and R. L. SMITH, *Illum. Engng*, **54**, 221-225 (*April*, 1959).

In order that the very high illumination levels of some present-day lighting installations can be achieved without introducing glare discomfort, the light source must be large in area (e.g., a luminous ceiling) rather than high in luminance. Light-controlling media (e.g., prismatic lens plates) have an advantage over light-diffusing media in reducing source luminance, and hence discomfort, at near-horizontal viewing angles. Furthermore, light-controlling media have a higher coefficient of utilisation than light-diffusing media. Tests have shown that standard candlepower measurements on a 4 ft. square sample of luminous ceiling can be used to obtain coefficients of utilisation corresponding to an entire ceiling. P. P.

621.327.534.15

722. Problems of luminance regulation in fluorescent lamps.

W. HARTEL, *Lichttechnik*, **11**, 184-191 (*Apr.*, 1959). *In German.*

More than half the paper is devoted to a description, in some detail, of the electrical characteristics of fluorescent lamps. To a good approximation the luminance is proportional to the lamp current. There are three methods of control: (a) the phase angle at which the discharge commences in each half period may be varied by the use of two thyratrons connected in opposite senses, (b) the ballast resistance (or inductance) may be altered, (c) a combination of (a) and (b) may be used. The bibliography contains only one reference to British or American work.

J. W. T. W.

LIGHTING

628.972

723. Fluorescent tube lighting in a chlorine factory.

Ljuskultur, **31**, 35 (*Jan.-March*, 1959). *In Swedish.*

A brief illustrated note of the use of suspended fluorescent fittings with electrolytically lacquered overlay and plastic diffusers caulked with foam plastic to resist the corrosive atmosphere. R. G. H.

724. A well-lit hotel restaurant. 628.972

B. AGREN, *Ljuskultur*, **31**, 17 (*Jan.-March*, 1959). *In Swedish.*

A hotel restaurant at Södertälje has been re-lit making extensive use of low voltage lamps in aluminum reflectors with coloured cylindrical glass fittings. Emphasis lighting on walls and curtains is a feature of the banqueting room. R. G. H.

725. Swedish railways consult "Ljuskultur." 628.972

I. SJOLANDER, **31**, 8 (*Jan.-March*, 1959). *In Swedish.*

The rebuilding and extension of Stockholm Central Station demanded new lighting. "Ljuskultur" advised on the lighting of concourses, offices and shops. Details are given of the systems used. Shops and stalls were provided with a combination of general diffuse lighting from large low brightness units and filament spot lighting on displayed merchandise behind the sales counter. The large open glass fronted ticket office receives 120 lm/ft² from inbuilt ceiling lights. The tunnelled concourses are lit by ceiling mounted fluorescent units with provision for increasing the illumination in due course. R. G. H.

628.971

726. Keys to more beautiful livable home grounds.

A. C. NORCROSS, M. V. BRINER and M. E. WEBBER, *Illum. Engng*, **54**, 189-199 (*April*, 1959).

Contemporary domestic lighting is concerned not only with the lighting within the home but also with the lighting of the surrounding garden. The techniques and equipment for successfully lighting a garden at modest cost are dealt with, and the lighting specifications for a number of individual gardens are described with tables and illustrations. P. P.

628.93

727. Predetermination of luminances by finite difference equations.

P. F. O'BRIEN and J. A. HOWARD, *Illum. Engng*, **54**, 209-215 (*April*, 1959).

The predetermination of the illumination/luminance pattern of an environment resulting from given lighting conditions requires the solution of an expression for the transfer of radiant flux. Except in the most simple cases, only an approximate solution for this expression is possible, using a series of finite-difference equations. Regardless of the type of computer (digital or electrical analogue) used to solve these equations, it is necessary to assume that the environment comprises a relatively few uniform-luminance surfaces. The error introduced by this assumption has been checked for a very long room with the walls divided into 1, 2, 4 and 8 sections. Division of the wall surfaces into more than four sections results in only a very small increase in accuracy. P. P.

628.932

728. Utilization factor for indirect cove lighting with fluorescent lamps.

B. JACOBSEN, *Lichttechnik*, **11**, 191-193 (*April*, 1959). *In German.*

The quantities which govern the utilisation factor in a room with cove lighting are room index, reflection factors, angle of cut-off of the cove and its dimensions, distance of cove from ceiling and distance of lamps from wall. The first two are catered for by a table of the usual kind or a nomogram, the remainder by means of tables or graphs giving correction factors, so that the final utilisation factor is obtained as a continued product of six terms. It is pointed out that the method gives no indication of the evenness of illumination of the ceiling. The use of the method is explained by means of a worked example. The values given in the various graphs or tables have been obtained by measurements made in models and in full-scale rooms.

J. W. T. W.

AGIP Motels in Italy

Architect, Mario Bacciocchi

THE refining and distributing section of the Italian state petroleum organisation—AGIP—has added to its numerous activities the construction and management of a chain of motels. Combined with service stations equipped to carry out minor repairs, these motels are intended for the long-distance lorry driver and the less affluent tourist, providing at relatively low cost a high standard of accommodation and food.

The buildings are simply constructed in a fairly uniform style—modern in appearance but deriving a good deal from the traditional forms of Italian architecture. There are single-pitched roofs, casement windows fitted with tambour shutters (opening on to small balconies with wrought-iron balustrades) and, inside, extensive use of terrazzo and other indiginous finishes. Mostly three or four storeys high, the motels have public rooms —restaurant, snack bar and combined lounge and entrance hall—on the ground floor, with two or three bedroom floors above.

Simply furnished with elegant modern furniture, the motels are lit mainly by fluorescent lamps—for low current consumption in a country where electricity is expensive. The fittings give evidence of an attempt to provide high output without too great an appearance of austerity. While each motel has its individually designed scheme, restaurants and lounge areas are usually lit by fully enclosed fittings mounted vertically on columns or between windows on the external walls. In the high-ceilinged restaurant of a motel near Milan there is a row of 8-ft. fittings suspended from the ceiling, with open bottomed reflectors, diabolo-shaped in section, alternately painted bright green and bright red.

Decorative table lamps are used in some restaurants ; recessed downlights in entrance halls and over some bars ; continuous rows of fluorescent lamps in suspended troughs over snack bars, etc. Lighting in bedrooms includes adjustable fittings over the lavatory basin and at the bedhead—the former fitted with an open-bottomed circular opal-glass shade, the latter with a diabolo-shaped spun-metal reflector.

Opposite, lounge and entrance hall of Motel S. Donato Milanese, near Milan, looking through glass screen into restaurant. Fully enclosed fluorescent fittings are fixed vertically to the external wall. This page: Top, fluorescent lamps in diabolo-section perforated metal trough, following the plan of the counter, in snack bar of Motel di Trento. Centre, bar in Motel Brescia, with suspended canopy into which downlights are partly recessed. Bottom, restaurant of Motel Trento, with clerestory lighting and suspended fittings for circular fluorescent lamps.

Correspondence

Appraisal of Discomfort Glare

Sir,—The comparison between glare appraisals and calculated values reported by Mr. Rowlands in your March issue makes interesting reading. However, the conclusion that he draws from the result (in effect, that all "glare formulæ" are virtually useless) is a little disappointing. Indeed, when one considers the amount of work that has gone into the development of such formulæ—not to mention the encouraging results obtained in the previous American and Australian field tests—this finding is not only disappointing but also slightly surprising.

A critical examination of Mr. Rowlands' results is not easy, for his brief report necessarily omits much of the background information. However, there are one or two comments which can perhaps be made.

For a start, it should be noted that a fairly high proportion of his test installations employed high-brightness lamps in open industrial-type luminaires. The writer is under the impression that the glare formulæ examined are largely based on laboratory tests with diffusing sources (or fluorescent lamps) of moderate luminance. Sources of this kind were used in the American and Australian field tests mentioned above, and one can hardly expect the semi-empirical simplified glare formulæ to be equally successful when applied to an entirely different type of unit.

Incidentally, even in those cases where luminaires of more appropriate type have been used, there seems to be some quite serious discrepancies between Mr. Rowlands' calculated Harrison-Meaker Glare Ratings and the figures one would expect from a study of the Glare Factor tables in the 1947 H-M paper. However, the absence of any information about the luminance of the units employed makes this difficult to check properly.

This still does not explain why Mr. Rowlands' observers seem so much more tolerant of glare than their opposite numbers in the American and Australian tests, a point noted in his report. But here his remark that only a few of his observers were lighting engineers is perhaps significant—especially in view of the fact that all assessments had to be made in a very short time.

Discomfort glare is cumulative in its effect, and it is notorious that an installation which may appear quite comfortable (and even "attractively bright") at a casual glance, can become very trying to people who have to work under it all day long. Because of this, considerable skill and experience is called for when making a series of rapid assessments. In both the American and the Australian field tests considerable importance was attached to the employment of experienced lighting engineers as observers.

Lastly, there is the most important point of all; namely, that the "glare formula approach" is supported by an impressive amount of laboratory work by a number of independent investigators. Moreover, this work has already produced much useful practical information. For instance, it has demonstrated beyond doubt that the degree of glare produced by an interior lighting installation is greatly influenced by a number of previously ignored factors such as the shape and size of the room and, in some cases, the orientation of the luminaires.

In addition, basic research has progressed far enough to give at least a preliminary idea of the quantitative allowance that ought to be made for these things when laying down luminance limits for certain types of lighting unit thus making it possible to replace the exceedingly meagre and approximate information on the subject in our lighting codes with something just a little bit better. A step in this direction has in fact already been made in the new Australian artificial lighting code published by the Standards Association of Australia. This code, whilst retaining a conventional form of shielding-angle table for open luminaires, has made use of the new basic information about glare to produce a table of luminance limits for translucent diffusers and bare fluorescent lamps which gives considerably better guidance than did the previously used table which only took into account the mounting height of the units.

It will be seen that even at this early stage the "glare formula approach" is of practical as well as academic interest, and there is great need for further investigation of it to enable tables of the above mentioned kind to be made more and more accurate. It would therefore indeed be a pity if Mr. Rowlands' published conclusions were to be allowed to in any way discourage further exploration of the matter.—Yours, etc., J. C. LOWSON.

Melbourne.

June 12th, 1959.

Situations

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I.E.S. MONOGRAPH No. 1

Inter-reflection and Flux Distribution in Lighted Interiors

By J. A. Lynes, B.Sc. (Eng.), Dip. M.I.E.S.

This monograph describes a method for calculating the distribution of light due to multiple reflections inside a room. Worked examples are included which, in addition to illustrating the technique, show the effect of (i) varying the reflection factor of individual walls separately, (ii) non-uniform wall luminance, (iii) a specular or glossy wall, and (iv) a vertical obstruction within the room. A method of predicting changes in surface colours due to inter-reflections is also briefly discussed.

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Personal

Mr. G. B. DURHAM and Mr. R. A. HALL have been appointed Regional Engineers to the British Lighting Council for the areas covered by the London and Eastern Electricity Boards, and the North Eastern Electricity Board respectively. Mr. Durham will operate from the BLC headquarters in London and Mr. Hall from Northgate House, St. Mary's Place East, Newcastle-upon-Tyne.

Mr. A. E. PAGE, General Manager of the Osram Lamp Division of the GEC Ltd., has been elected Chairman of the British Lighting Council in succession to Mr. D. Bellamy, DL, CBE, Chairman of the Yorkshire Electricity Board. Mr. Bellamy was the first Chairman of the Council, and held the office for two years.

Mr. R. A. DULLER has been appointed a Lighting Division representative in the South-East Region of Philips Electrical Ltd. He will cover the south east districts of London.

Mr. ROLAND BOISSEVAIN has been appointed to the Board of Merchant Adventurers Ltd. He has been for a number of years the Sales Manager, and is a director of a subsidiary company " Ventura Lighting Ltd."

Holophane announce the appointment of Mr. JACK BIGGS as Sales Lighting Engineer for the Manchester area. Mr. Biggs has been connected with the electrical and lighting industry for many years, beginning his career in 1935 with the Bolton Corporation Electricity Undertaking. He left in 1952 to join the Stella Lamp Co. as Lancashire area representative, and for the past four years has been with Brown Bros. Ltd. (Wholesalers), Salford Branch, as a departmental manager on the sales side.

Appointments to the staff of Harris and Sheldon (Electrical) Ltd., during the last few months include the following:—

Mr. H. M. HUME, Dip.MIES, has been appointed Chief Lighting Engineer at Birmingham. He joined Philips Electrical Ltd. in 1947 and in 1955 was appointed manager of their Lighting Service Bureau in Calcutta.

Mr. H. A. TURNER, Dip.MIES, Area Engineer, South West England. Mr. Turner was Lighting Engineer and Departmental Manager at the GEC Swansea until 1949 when he was appointed to a similar position at Bristol.

Mr. R. A. CHAPPELL, Dip.MIES, who is in the London area, won the C and G Bronze Medal in 1956. Before joining Harris and Sheldon Mr. Chappell was with Falk Stadelmann.

Mr. A. C. JOHNSON, Dip.MIES, has been appointed Area Engineer, North West England.

Mr. HOWARD LONG, MIEE, FIES, has retired from The Benjamin Electric Limited after thirty years service and is acting as a Consulting Engineer, Lighting Specialist. Mr. Long, who is an Honorary Member of The Illuminating Engineering Society, has specialised in lighting since 1922 when he joined Holophane Ltd. after a period with Metropolitan-Vickers as Manager, Illumination Department. He became Manager, Engineering Department with Benjamin, followed by seventeen years as Midland Area Manager and latterly as Manager, Technical Sales and Development. Among his many activities he was primarily responsible for the formation of the Birmingham Centre of the IES. He is a past Vice-President of the IES and a full member of the American IES currently serving as a corresponding member of several of their technical committees.

Mr. H. C. WHITE, of Philips Electrical Ltd. has been elected Chairman of the Electric Lamp Industry Council for the year beginning July 1st, 1959.

Mr. L. J. ROBINSON has been appointed a senior street lighting representative of Atlas Lighting Ltd. covering London and southern England. Mr. Robinson was formerly with Revo Electric Co. Ltd.

Mr. JAMES MARTIN, Dip.MIES, has been appointed Sales Manager of Casemakers Ltd., Soho Hill, Handsworth, Birmingham 19. Mr. Martin will operate from the company's London office, Morley House, 26, Holborn Viaduct, E.C.1.

Mr. A. M. SCALES, of Atlas Lighting Limited, has been appointed Area Sales Manager for Scotland and will operate from the company's office at 9/15, Waverley Street, Glasgow, S.1.

IES Forthcoming Meetings

LONDON

October 13th

Presidential Address—" Some Aspects of Mechanical Advancement During the Life of the Society," by H. G. Campbell. At the Federation of British Industries, Tothill Street, S.W.1. 6.15 p.m.

Jubilee Lectures

October 15th*

" The Nature of Light," by Sir Lawrence Bragg. At The Royal Institution, Albemarle Street, W.1. 6 p.m.

October 19th*

" The Generation of Light," by L. J. Davies. At Caxton Hall, Caxton Street, S.W.1. 6 p.m.

October 22nd*

" Light and Road Safety," by Dr. W. H. Glanville. At The Institution of Civil Engineers, Great George Street, S.W.1. 6 p.m.

October 27th*

" Light and Productivity," by A. H. Irens. At the Federation of British Industries, Tothill Street, S.W.1. 6 p.m.

**Admission to the above lectures is by ticket only, obtainable from the IES Secretary.*

October 30th

President's Reception at County Hall, S.E.1. 7 p.m.

CENTRES AND GROUPS

September 1/21st

GLASGOW.—Golden Jubilee Exhibition of Ancient and Modern Artificial Lighting. At Glasgow Museum and Art Galleries.

September 28th

BATH and BRISTOL.—" Recent Industrial Installations and Some Particular Problems," by J. G. Holmes. At Gardiner Sons and Co. Ltd., Broad Plain, Bristol.

BIRMINGHAM.—Chairman's Address by J. R. Yeates, at Regent House. Followed by Informal Supper, at Crown Hotel, Broad Street.

LEICESTER.—Chairman's Induction.

September 30th

EDINBURGH.—"The Application of Modern Techniques to Industrial Lighting," by D. C. Pritchard. At the YMCA Social Room, 14, South St. Andrew Street, Edinburgh.

October 1st

GLASGOW.—"Hospital Lighting," by D. C. Pritchard. At the British Lighting Council, 29, St. Vincent Place, Glasgow, C.1. 6.30 p.m.

MANCHESTER.—"Lighting for People," by W. E. Harper. At the Free Trade Hall, Manchester. 7 p.m.

October 6/26th

MANCHESTER.—Exhibition—Lighting Through the Ages. At the Central Library, Manchester.

October 6th

HULL.—"Lighting and Other Things in Moscow," by A. G. Penny. At the Lecture Theatre, Yorkshire Electricity Board, Ferensway, Hull. 6.30 p.m.

STOKE-ON-TRENT.—"Lighting in Industry in the Soviet Union," by Dr. E. H. Norgrove. At the North Stafford Hotel, Stoke-on-Trent. 6 p.m.

October 7th

NEWCASTLE-UPON-TYNE.—Annual General Meeting followed by Chairman's Address by B. Wray. Room B7, Percy Building, Kings College, Queen Victoria Road, Newcastle-upon-Tyne. 6 p.m.

October 8th

NOTTINGHAM.—"Some Practical Consideration in the Design and Manufacture of Neon Signs," by A. Urquhart. At the Electricity Centre, Carrington Street, Nottingham. 6 p.m.

October 9th

LEEDS.—Golden Jubilee Dinner and Chairman's Induction. At the Queen's Hotel, Leeds.

October 12th

SOUTH AFRICA.—"Plastics and Modern Trends in Lighting," by P. H. Collins.

SHEFFIELD.—Chairman's address by V. Loupart.

October 20th

LIVERPOOL.—Chairman's Address. At the Merseyside and N. Wales Electricity Board, Industrial Development Centre. 6 p.m.

NORTH LANCASHIRE.—"Lighting in Relation to Public Safety," by J. White. At the Demonstration Theatre, North Western Electricity Board, 19, Friargate, Preston. 7 p.m.

October 22nd

MANCHESTER.—"Lighting for Premises," by J. M. Waldram. At the Free Trade Hall. 7 p.m.

October 26th

LEEDS.—"Colour Television," by Dr. G. N. Patchett. At the Institute of Technology, Bradford.

LEICESTER.—"Home Lighting," by K. S. Morris. Joint Lecture with the EAW. At the Demonstration Theatre, East Midlands Electricity Board, Charles Street, Leicester. 7 p.m.

October 29th

BATH and BRISTOL.—Jubilee Commemoration Meeting—Exhibition, Building Centre, Bristol.

Lecture—"Light and Daily Life," by J. M. Waldram.

Trade Literature

A.E.I. LAMP AND LIGHTING CO. LTD., Melton Road, Leicester. Illustrated leaflet giving full details of the "Series 2" range of fluorescent fittings.

COURTNEY, POPE (ELECTRICAL) LTD., Amhurst Park Works, Tottenham, London, N.15. — Illustrated catalogue divided into sections covering fluorescent fittings, special ceilings, neon signs and tungsten fittings. Also available "Ceilings" booklet showing the "Glolite" and "Brite-glo" luminous ceilings.

GENERAL ELECTRIC CO. LTD., Magnet House, Kingsway, London, W.C.2. "Display Lighting," F.4571 contains full details and prices of all types of display lighting, together with index and general information.

LINOLITE LTD., 118, Baker Street, London, W.1. An abridged catalogue No. 37 of some of the company's range of light fittings, strip reflectors and signs. The main 1959/60 catalogue will soon be available.

S.L.R. ELECTRIC LTD., 2, Peterborough Road, Harrow, Middlesex. Leaflets 37 and 38 illustrating the "Cylaire" and "Linaire" fittings.

POSTSCRIPT By 'Lumeritas'

THIS wonderful summer has certainly given us full measure of brilliant daylight and cheering sunlight. Even those who have to spend the working day in rooms into which only a miserly fraction of the available daylight can penetrate will have had more than their usual share of natural light. As is well known, the fraction of the exterior illumination which is available in an interior has to be used as an index of the "amplitude" of interior daylighting because the normal diurnal variation of daylight illumination makes an index in terms of lumens per square foot impracticable. This inconstancy of natural illumination is often regarded as making it inferior to the constant illumination which can be got from an installation of man-made light sources. There is truth in this when the variation of daylight happens to be so considerable that there is a fluctuation from adequacy to inadequacy. But, so long as inadequacy is not reached, the variability of daylight is surely one of its virtues, for variety is as much the spice of lighting as it is of life.

THE photometric appraisal of the daylighting of any interior has become easy and familiar in the present century but in the first half of the nineteenth century it was both inconvenient and novel, as may be gathered from the following quotation from *The Magazine of Science* for May, 1840. "Dr. Ure having failed in obtaining accurately the intensities of different lights, by a comparison of the relative shadows they project—has employed the following photometric means. He placed several pieces of paper, prepared with the salts of silver as for the photogenic drawings, in the rooms of a house darkened by a high wooden wall, or board, before the windows; and also in those of a neighbouring house not so circumstanced. In a certain time, those exposed to the action of free daylight acquired a certain depth of tint; and by observing the time required to produce the same tint on those papers placed in the darkened room, Dr. Ure was enabled to determine the amount of daylight so diminished. By photogenic impressions, Dr. Ure considers the relative degrees of diurnal illumination in different rooms in any house, in different countries, or on different days in the same house or country, also the extent or strength of daylight in any part of the world—may be correctly measured and registered."

THE development of new sodium lamps having a luminous efficiency of 100 lumens per watt is certainly something worth "shouting about" and so it is no wonder that AEI have duly publicised this achievement by Dr. A. B. Whitworth and his colleagues at Leicester. It is less than fifty years since filament lamps having no more than ten per cent of this efficiency were introduced, and domestic filament lamps of less than 40 watts rating still do not have an output exceeding 10 lumens per watt. Lamps of lower rating and efficiency are still used in various situations where a policy of minimum illumination is pursued to effect a meagre saving of electrical energy. The candle itself has by no means vanished from the list of light sources in current use. Apart from its very limited use as a dining light, and its very occasional use as an emergency light—as during the recent New York electricity supply failure and similar mishaps of our own—it is regularly used in some of the dormitories of at least one of our most famous public schools. I have no doubt that it also still lights quite a number of people to bed in other habitations.

THE "father" of lighting engineers—Count Rumford—made some interesting observations showing the importance of good maintenance in candle lighting. He found that the light emitted by a tallow candle eleven minutes after it had been snuffed diminished to 39 per cent of the initial output. In 19 minutes it fell to 23 per cent and, in 29 minutes, to only 16 per cent. He also found that when the candle was burning very dim for want of snuffing the consumption of combustible matter was more than doubled although much less light was emitted. Fortunately, modern light sources do not need snuffing though they need to be cleaned regularly to avoid serious loss of utilisable light and serious increase in the cost per unit of illumination obtained.

However, I suppose that the use of candles for the ordinary purposes of lighting is certainly now less than their use as votive offerings. For religious purposes the consumption of candles must be quite considerable, and the ritualistic uses of light is not confined to the practice of one religious sect. Early in August the people of Nagasaki set lighted lanterns adrift on the Urakami River to "calm the souls" of the many victims of the atomic bomb which devastated their city in 1945. On this same anniversary a torchlight procession made its way to the rebuilt Roman Catholic cathedral of the city, and every night—from Easter to October—many hundreds of pilgrims, each carrying a candle torch, walk in procession to the churches at the famous Grotto of Lourdes in the Pyrenees. I wonder, will suitably devised battery-operated electric torches ever supersede the traditional candle and flame torches used in the performance of religious rites and ceremonies? Why shouldn't they? Yet I hope they won't!

G.E.C.

POST-TOP DECORATIVE LANTERN

for STREET LIGHTING

Among its many outstanding features are :—

- Tapered cylindrical "Perspex" body incorporating sealed-in "Perspex" refractor plates.
- All spinnings in aluminium.
- Smooth exterior for ease of cleaning.
- Tube operating gear housed within the lantern under the top "mushroom" shaped spinning.
- Handsome bronze finish to exterior metal components.

The G.E.C. Post-top decorative lantern has been designed for use with two 2 ft. 40W. Osram guaranteed fluorescent tubes and is intended for side road lighting. Light control is obtained by two vertical mounted "Perspex" refractor plates — a unique feature.

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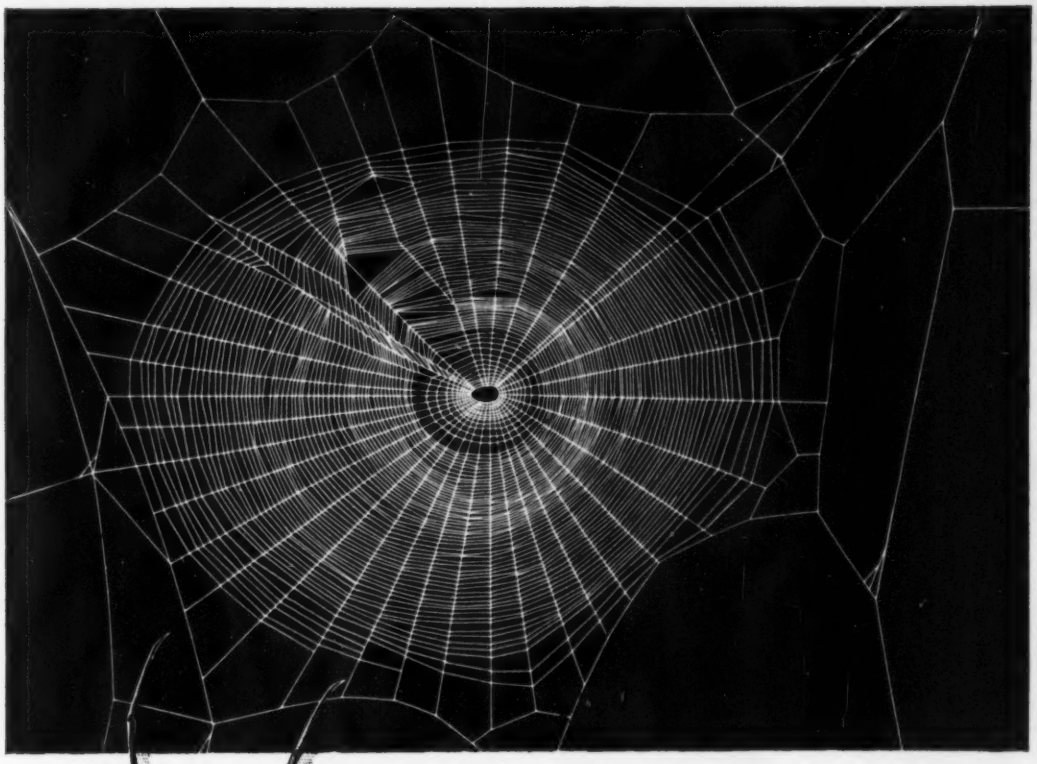


The tropical geometric spider Nephila

it hangs by a thread . . .

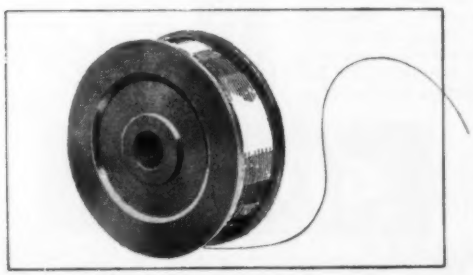
The wonders of Nature are often captivating in both senses of the word. The spider spinning its thin but tough web produces a thread that can hardly be measured. It is roughly 0.275 mils thick!

But the wonders of Nature are surpassed by modern engineering . . . At the Luma Works, the largest Scandinavian producers of incandescent and fluorescent lamps, tungsten and molybdenum wire is produced which, like the spider's thread, is not measurable by normal methods. The finest tungsten wire is only 0.197 mils thick.

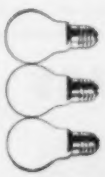
Luma exports 90 per cent of its tungsten and molybdenum wire, and Luma wire is used in radio valves and bulbs in more than 50 countries.

You, too, can get Luma wire in all dimensions and finishes — e. g. black, cleaned or plated, semi-finished rods or finished electrodes.

Write immediately for our new tungsten catalogue in English, French or German.



We manufacture all types of incandescent, mercury vapour, neon and fluorescent lamps, fluorescent fittings and accessories.



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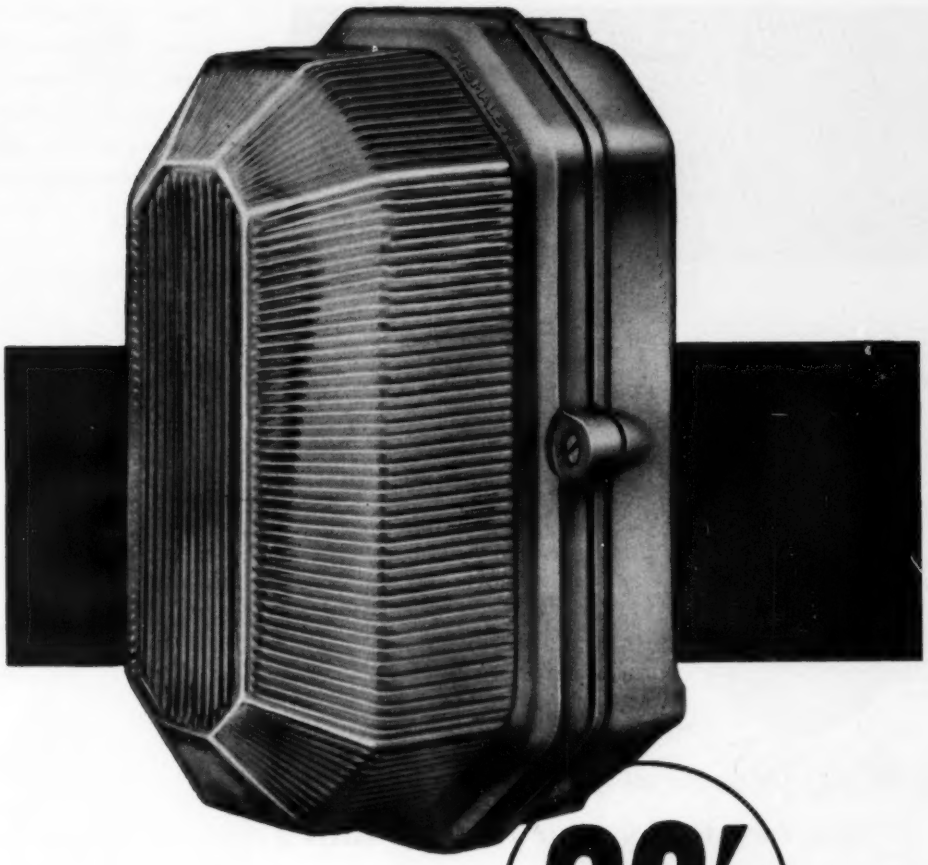

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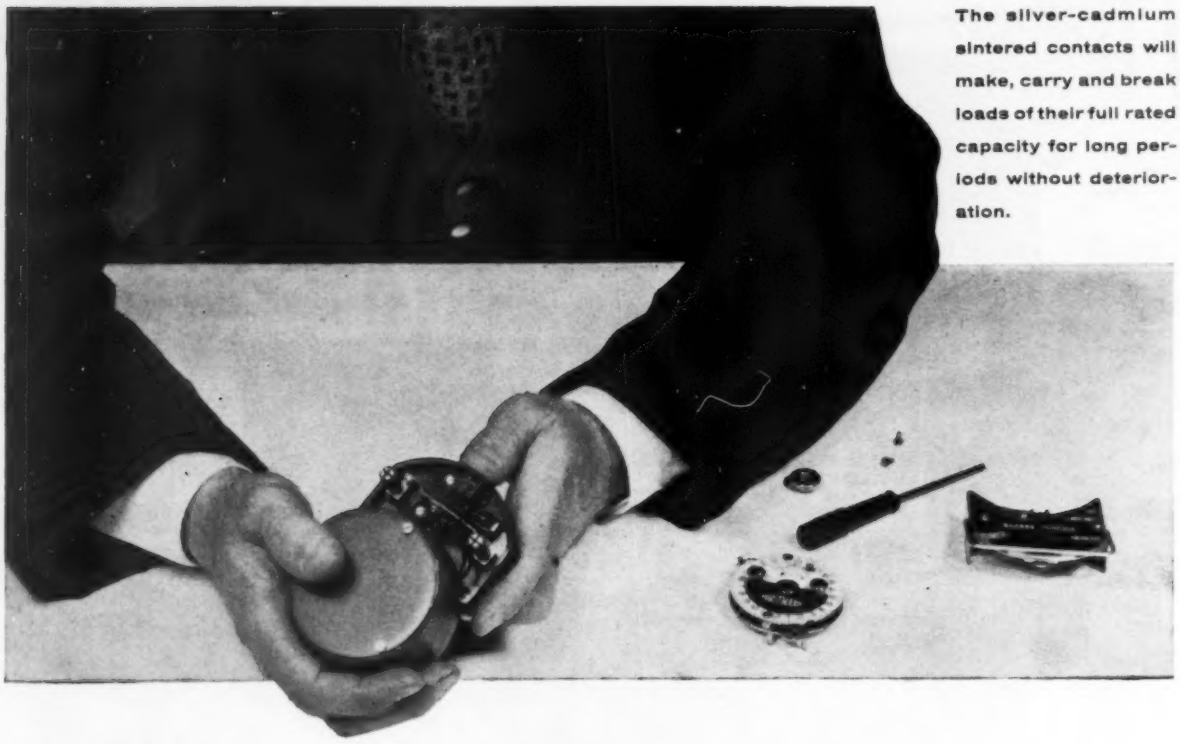

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This is the Horstmann Type K Mark II plug-in pattern Time Switch, with synchronous motor driven movement and with switchgear of 20 amps capacity at 200/250 volts, 50 cycles. Models to meet other requirements can be supplied to order.

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Published by THE ILLUMINATING ENGINEERING PUBLISHING COMPANY LIMITED, at 32 Victoria Street, London, S.W.1. 30, Victoria Street, London, S.W.1, England. Printed by KNAPP, DREWETT AND SONS LTD.

Lighting fittings made from 'Perspex' acrylic sheet by E. J. Scholfield and Co. Ltd., Manchester, installed in the new research block of Ferodo Ltd., Chapel-en-le-Frith.

Lighting fittings made from 'Perspex' ensure comfortable, efficient lighting in Ferodo Limited research block

LIGHTING FITTINGS in the new research block of Ferodo Ltd., Chapel-en-le-Frith, were made from 'Perspex' acrylic sheet by E. J. Scholfield and Co. Ltd., Manchester. Because they are made from 'Perspex', the lighting fittings offer these advantages:

★ Freedom from discolouration
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★ Superb appearance
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'Perspex' can be heat shaped and is available in clear sheet and a wide range of attractive transparent, translucent and opaque colours. Several grades of patterned 'Perspex' are available for diffusing finishes.

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Only one BC for all reflector types up to 150W.

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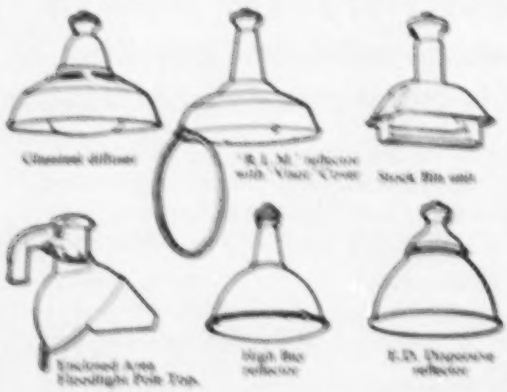

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E.D. Dispersive reflector

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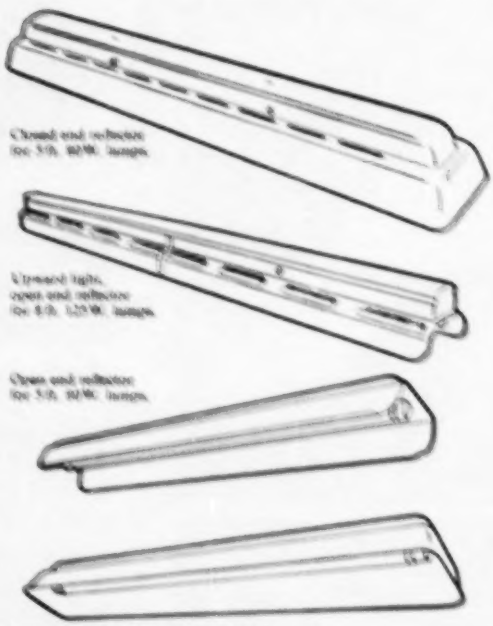

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Upward light, open end reflector for 4 ft. 125 W. lamps.

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Acrylic plastic closed top, closed end reflector for 5 ft. 80 W. lamps.

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